Conservation Services Programme Annual Research Summary 2017-18

Shannon Weaver
Conservation Services Programme
Department of Conservation
February 2019

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1. Introduction

1.1 Purpose

This report outlines the research carried out through the Conservation Services Programme Annual Plan 2017/18 and provides updates on multi-year projects started in previous years.

1.2 Background

The Department of Conservation has the statutory duty to protect certain marine animals as defined in the Wildlife Act 1953 and the Marine Mammals Protection Act 1978. While the sustainable management of fishery resources is the statutory responsibility of the Minister of Fisheries (Fisheries Act 1996), the protection and conservation of seabirds, marine mammals and other protected species is the responsibility of the Minister of Conservation.

Since 1995, the New Zealand government has been implementing a scheme, to recover from the domestic commercial fishing industry, a proportion of funding required to investigate and mitigate the impacts of fishing on protected species of marine wildlife (Conservation Services). Conservation Services are defined in the Fisheries Act 1996 (as amended in 1999) as being outputs produced in relation to the adverse effects of commercial fishing on protected species, as agreed between the minister responsible for administering the Conservation Act 1987 and the Director-General of the Department of Conservation.

1.3. CSP Vision and Objectives

The Conservation Services Programme (CSP) vision is that:

> "Commercial fishing is undertaken in a manner that does not compromise the protection and recovery of protected species in New Zealand fisheries waters".

The suite of research and other conservation services delivered as part of the CSP falls into three categories:

1. Understanding the nature and extent of adverse effects on protected species from commercial fishing activities in New Zealand fisheries waters.
2. Developing effective solutions to mitigate adverse effects of commercial fishing on protected species in New Zealand fisheries waters.
3. Developing population management plans, where appropriate.

Detailed outcome-based objectives for CSP are provided in the Conservation Services Programme Strategic Statement 2018[1].

[1] Available to download from https://www.doc.govt.nz/contentassets/28f0780f0ef845aba7d2883849594d26/csp-strategic-statement-2018.pdf

1.4 Development of the Annual Plan

The Conservation Services Programme Annual Plan 2016/17[2] described the conservation services to be delivered as the Conservation Services Programme (CSP), and subject to cost recovery from the commercial fishing industry. As such, this Annual Plan formed the basis for levying the commercial fishing industry under the Fisheries Act 1996. For further background information on CSP, including extracts of relevant legislation, refer to the Conservation Services Programme Strategic Statement. In the development of this Annual Plan a series of discussions were held with Ministry for Primary Industries (MPI) staff to harmonize the CSP and MPI research programmes for 2016/17 and to ensure there was no duplication. A formal consultation process was also used as described below.

1.5 Consultation process

The Annual Plan took account of feedback from stakeholders, and was approved, along with the final costs to be levied, by the Minister of Conservation.

The collaborative processes used to develop the 2017/18 Annual Plan are as follows:

-Inshore observer coverage is based on a continuation of delivering objectives identified by a process conducted in preparation for the CSP Annual Plan 2017/18. This process was developed jointly by the CSP team at the DOC and the Inshore Fisheries team at Fisheries New Zealand (FNZ).

-Deepwater and Highly Migratory Species (HMS) observer coverage was developed jointly by the CSP team at DOC and the deepwater and HMS fisheries team at MPI.

Key stages for stakeholder input, including formal consultation on this plan, were as follows:

13 December 2016	Initial CSP RAG meeting – review and gap analysis.
24 February 2017	Updated medium term research plans, initial list of research proposals and draft CSP RAG prioritisation framework circulated to CSP RAG.
1 March 2017	Second CSP RAG meeting to discuss and prioritise initial research proposals.
19 March 2017	Additional feedback received from CSP RAG on research proposals and their prioritisation.
14 April 2017	Draft Conservation Services Programme Annual Plan 2017/18 released for public consultation
15 May 2017	Public consultation period closes
May 2017	Summary of public submissions and response to comments completed
June 2017	Director-General of Conservation conveys the Conservation Services Programme Annual Plan 2017/18, amended in accordance with public submissions, to the Minister of Conservation for agreement

1.6 Explanation of reporting structure

This report first describes the objectives and rationale for each project, then provides an update on project status and a summary of the key results and recommendations from the projects. A project

[2] Available to download from https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/plans/final-csp-annual-plan-2017-18.pdf

logistics summary statement is included detailing the service provider, the project budget (excluding administration costs), identification of the relevant provisions within the Fisheries (Cost Recovery) Rules 2001 that determine cost allocation and review milestones. Finally, a citation and weblink are provided to enable ease of access to the final research reports.

Conservation Services Programme activities in 2017/18 were divided into three main areas:

1. Fisheries interactions projects
2. Population studies
3. Mitigation projects

2. Interaction Projects

2.1 INT2016-01 Observing commercial fisheries

Overall objective

To understand the nature and extent of protected species interactions with New Zealand commercial fishing activities.

Specific objectives

1. To identify, describe and, where possible, quantify protected species interactions with commercial fisheries
2. To identify, describe and, where possible, quantify measures for mitigating protected species interactions
3. To collect information relevant to identifying levels of cryptic mortality of protected species resulting from interactions with commercial fisheries
4. To collect other relevant information on protected species interactions that will assist in assessing, developing and improving mitigation measures

Rationale

Understanding the nature and extent of interactions between commercial fisheries and protected species can identify where the most significant interactions are occurring and can be used to inform development of ways to mitigate those interactions and adverse effects. Such data contribute to assessments of the risks posed to protected species by commercial fishing and whether mitigation strategies employed by fishing fleets are effective at reducing protected species captures.

The CSP Observer Programme continued to purchase baseline services for “offshore” (deepwater) fisheries from FNZ Observer Services, given the scale of their operation, which allowed observers to be placed strategically across New Zealand Fisheries. For the purposes of providing costings, the rate provided by MPI Observer Services has been used.

Project status

Complete.

Summary of the methods and key findings

One of the tools to gain a better understanding of the nature and extent of interactions between commercial fisheries and protected species is the placement of Government observers on board commercial fishing vessels operating within the New Zealand Exclusive Economic Zone (EEZ). The observers collect both quantitative and qualitative information on interactions, both of which can and have been used to identify key areas of importance. The observations can also help in the development and assessment of mitigation strategies aimed at reducing the impact of commercial fisheries on protected species.

Observer coverage is, where possible, planned jointly with the FNZ to ensure that coverage objectives are aligned. For the purposes of planning observer coverage, fisheries are divided into two broad categories: firstly, those fisheries that are poorly observed and generally characterised by small vessel,

owner operated fleets operating in the inshore, the second; better understood deepwater fisheries which have been subject to long-term monitoring.

While the majority of the 'poorly understood' fisheries operate in the inshore area (i.e. in waters generally less than 200 m depth), some small vessels, particularly bottom longline vessels under 36 m, will operate in deeper waters such as the Chatham Rise. Details of the approach used to allocate days in these fisheries are described in the Joint Department of Conservation/Ministry of Fisheries Inshore Observer Programme 2011/12 plan[3]. In general, coverage in these fisheries was aimed at reducing uncertainty around the risk to particular protected species identified in both the level 1 and level 2 risk assessments and assessing mitigation options for interactions identified.

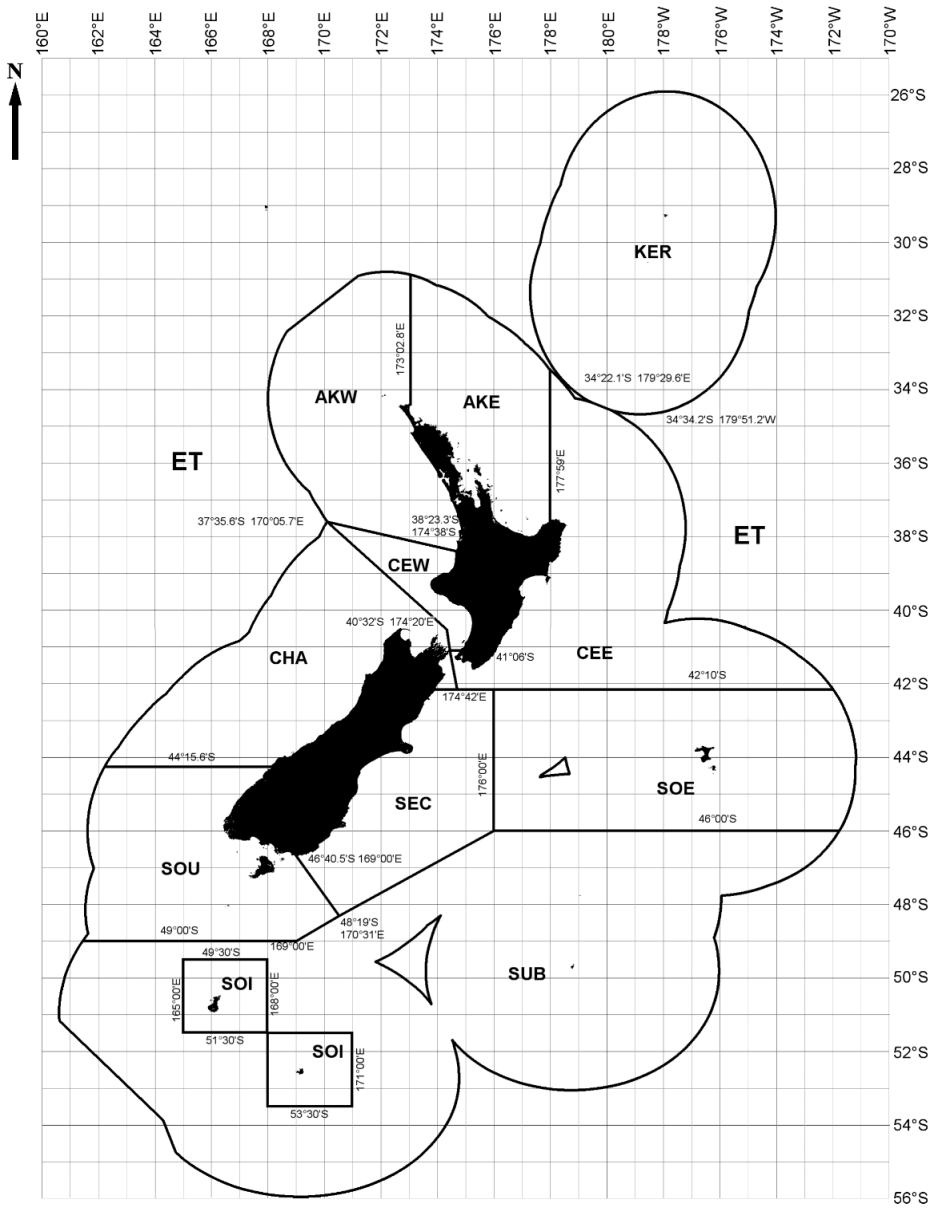
For better observed fisheries, long-term datasets exist which allow for ongoing monitoring to detect whether changes are occurring in the nature and extent of captures. In these offshore fisheries where higher levels of coverage are already undertaken, CSP purchases a portion of existing observer time to allow data collection to be spread strategically over the fishing fleet.

The observer coverage presented in this report extends on work conducted in previous years.

The remainder of this project report is divided into separate 'fisheries' where certain target species are grouped according to fishing method. For each 'fishery' an overall summary of commercial effort, observer effort and protected species bycatch is provided by Fisheries Management Area (Figure 1). Protected species interactions are then broken down by observed state of the animal (live or dead) and type of interaction or capture.

[3] https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/approved-mcs-annual-plan-2011-12.pdf

Figure 1: New Zealand Fisheries Management Areas (source: Ministry of Fisheries)



Key:

AKE	FMA 1	East North Island from North Cape to Bay of Plenty
CEE	FMA 2	East North Island from south of Bay of Plenty to Wellington
SEC	FMA 3	East coast South Island from Pegasus Bay to Catlins
SOE	FMA 4	Chatham Rise
SOU	FMA 5	South Island from Foveaux Strait to Fiordland
SUB	FMA 6	Subantarctic including Bounty Island and Pukaki Rise
SOI	FMA6A	Southern offshore islands – Auckland and Campbell Islands
CHA	FMA 7	West Coast South Island to Fiordland including Kaikoura
CEW	FMA 8	West North Island from South Taranaki Bight to Wellington
AKW	FMA 9	West North Island from North Cape to North Taranaki Bight
KER	FMA 10	Kermadec
ET		Outside NZ EEZ

Middle Depth Trawl Fisheries

Hoki, Hake, Ling and Warehou species

Hoki, hake, ling, warehou trawl activity spans all months, FMAs and vessel sizes. Within the fishery complex there is a distinct subset targeting the hoki spawn in the Cook Strait. This occurs between June and September and is fished only by vessels under 42m in length, in an area straddling the CHA and CEE FMAs. The remaining fishing effort occurs during the other months with hoki, hake, ling and warehou targeted largely in SEC, SUB, SOE and partly SOU areas. All vessels over 28m in this fishery are required to use one of three regulated forms of bird scaring equipment and have codified fish waste (e.g. offal and discards) management. Industry defined codes of practice (Operational Procedures) also apply.

Table 1 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. In the 2017/18 observer year the commercial effort decreased slightly from the previous year (3% decrease in comparison to 2016/17 effort) and the amount of observed tows increased slightly, resulting in a 16% increase in the observer coverage (Hjorvarsdottir & Isaacs 2018).

Seabird captures increased by 85%, with 185 seabird captures in comparison to 100 in the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). The rate of marine mammal captures decreased by 7% on the previous year and no protected fish captures occurred. A total of 67.2kg of coral bycatch was observed this year, a small (2%) increase in coral catch in comparison the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). More than half (57%) of the coral bycatch occurred in the SUB FMA and overall, bushy hard coral (*Goniocorella dumosa*) was the most common coral bycatch in this fishery.

In summary, 116 observed trips were conducted on board 41 vessels, with protected species captures occurring on 59 trips on board 30 vessels (51% of observed trips involved protected species captures and 73% of these vessels had protected species captures in 2017/18).

Table 1. Summary of commercial effort, observer effort and protected species interactions in the hoki, hake, ling and warehou middle depth trawl fisheries during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	224	37	16.5	2	5.4	0	0.0	0.2	0.5
2. CEE	1,584	180	11.4	0	0.0	25	13.9	0.0	0.0
3. SEC	2,744	622	22.7	36	5.8	2	0.3	19.2	3.1
4. SOE	2,054	450	21.9	15	3.3	0	0.0	4.2	0.9
5. SOU	1,120	563	50.3	43	7.6	0	0.0	3.6	0.6
6. SUB	1,531	904	59.0	78	8.6	3	0.3	38.6	4.3
7. CHA	6,198	1,889	30.5	11	0.6	11	0.6	1.4	0.1
8. CEW	8	0	0.0	0	0.0	0	0.0	0.0	0.0
9. AKW	22	14	63.6	0	0.0	0	0.0	0.0	0.0
Total	**15,485**	**4,659**	**30.1**	**185**	**4.0**	**41**	**0.9**	**67.2**	**1.4**

Table 2 reports on the numbers of interactions by species and life status immediately post interaction for the 2017/18 observer year. Overall, 59% of protected species interactions resulted in mortalities. White-chinned petrels and white-capped albatross were the most commonly caught seabird species, and New Zealand fur seals the most commonly caught marine mammal.

One orca was recovered in a trawl with a range of severe injuries and in a possible state of decomposition. An expert workshop was held to investigate possible time and cause of death[4] as well as recommendations to support the development of data collection and reporting protocols for rare protected species capture events. Various hypotheses were considered and based on the available information it was felt that 'The orca was struck by a large vessel (i.e. comparable in size and speed to an oil tanker or a large container vessel), inflicting sufficient blunt force trauma to kill or incapacitate the orca'.

Table 2. Protected species interactions in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2017/18 observer year.

Species Name	Alive	Dead	Decomposing	Grand Total
Birds				
Albatrosses (unidentified)	7	2		9
Black-bellied storm petrel		1		1
Southern Buller's albatross	2	6		8
Buller's albatross (unidentified)	6	4		10
Campbell albatross		2		2
Common diving petrel	3			3
Fairy prion	1			1
Flesh-footed shearwater	2			2
Grey-faced petrel	1			1
Grey-backed storm petrel	1			1
Mid-sized Petrels & Shearwaters	1			1
Northern giant petrel	1			1
Petrels, Prions and Shearwaters	1			1
Prions (unidentified)	2			2
Procellaria petrels	3	3		6
Pterodroma petrels	1			1
Salvin's albatross	9	11		20
Shearwaters		1		1
Smaller albatrosses	1			1
Sooty shearwater	3	19		22
Southern royal albatross	1			1
Storm petrels	3			3
Wandering albatross (unidentified)	1			1
White-capped albatross	13	18		31
White-chinned petrel	23	32		55
Birds Total	**86**	**99**		**185**
Marine Mammals				
New Zealand fur seal	6	32	1	39
Orca		1		1
Pilot whale		1		1
Marine Mammals Total	**6**	**34**	**1**	**41**
Grand Total	**92**	**133**	**1**	**226**

[4] Workshop report available here: https://www.mpi.govt.nz/dmsdocument/29057/send

Tables 3a & b detail the broad method of interactions for each species. Trawl net capture (from here on 'net capture') was the most prevalent form of interaction overall, with 65% of these resulting in mortalities. The 39 captures of New Zealand fur seals that resulted in mortalities occurred across four FMA's, but these were predominantly in CEE and CHA (25 captures in CEE, 11 captures in CHA), this reflects the main fur seal mortality FMAs of the previous fishing year (Hjorvarsdottir & Isaacs 2018).

Table 3. Method of interaction for a) Protected species released alive and b) dead protected species observed in the hake, hoki, ling and warehou middle depth trawl fisheries during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Tangled in line	Unknown	Other	Grand Total
Birds						
Albatrosses (unidentified)	6				1	7
Southern Buller's albatross	1	1				2
Buller's albatross (unidentified)	4	1	1			6
Common diving petrel		2			1	3
Fairy prion					1	1
Flesh-footed shearwater	1				1	2
Grey-faced petrel		1				1
Grey-backed storm petrel		1				1
Mid-sized Petrels & Shearwaters	1					1
Northern giant petrel					1	1
Petrels, Prions and Shearwaters					1	1
Prions (unidentified)					2	2
Procellaria petrels	1	1			1	3
Pterodroma petrels	1					1
Salvin's albatross	6				3	9
Smaller albatrosses	1					1
Sooty shearwater	3					3
Southern royal albatross					1	1
Storm petrels					3	3
Wandering albatross (unidentified)	1					1
White-capped albatross	12				1	13
White-chinned petrel	19			1	3	23
Birds Total	**57**	**7**	**1**	**1**	**20**	**86**
Marine Mammals						
New Zealand fur seal	6					6
Marine Mammals Total	**6**					**6**
Grand Total	**63**	**4**	**1**	**1**	**12**	**92**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Impact against vessel	Other	Grand Total
Birds					
Albatrosses (unidentified)	1	1			2
Black-bellied storm petrel	1				1
Southern Buller's albatross	4	2			6
Buller's albatross (unidentified)	3	1			4
Campbell albatross	1	1			2
Procellaria petrels	3				3
Salvin's albatross	8	3			11
Shearwaters	1				1
Sooty shearwater	18		1		19
White-capped albatross	13	4		1	18
White-chinned petrel	32				32
Birds Total	**85**	**12**	**1**	**1**	**99**
Marine Mammals					
New Zealand fur seal	32				32
Orca	1				1
Pilot whale	1				1
Marine Mammals Total	**34**				**34**
Grand Total	**119**	**12**	**1**	**1**	**133**

Southern Blue Whiting

The southern blue whiting fishery is both spatially and temporally distinct from other middle depth trawl fisheries. The location of fishing effort is variable and dependent on the presence of spawning aggregations of southern blue whiting. Most effort occurs in the waters around Campbell Island. Unlike other middle depth trawl fisheries, protected species interactions tend to be dominated by marine mammal captures, specifically fur seals. Observed sea lion captures, however, have occurred in most previous fishing years at variable levels (up to 14) (Rowe 2009, Rowe 2010, Ramm 2010, Ramm 2012a, Ramm 2012b, Clemens-Seely et al. 2014, Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016, Hjorvarsdottir 2017, Hjorvarsdottir & Isaacs 2018).

Table 4 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. This fishery received full observer coverage this year and had a slightly increased amount of tows to the 2016/17 year (up by 2.3%). The number of seabird interactions in the 2017/18 observer year was equivalent to the previous year (2016/17) (Hjorvarsdottir & Isaacs 2018). Mammal captures on the other hand decreased substantially by 82% from the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). No protected fish or coral captures occurred in this fishery during this reporting period.

In summary, 12 observed trips were conducted on board 10 vessels, with protected species interactions occurring on five trips on board five different vessels (42% of observed trips involved protected species interactions and 50% of these vessels had protected species interactions in 2017/18).

Table 4. Summary of commercial effort, observer effort and protected species interactions in the southern blue whiting fishery during the 2017/18 observer year.

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Mammal captures	Mammals /100 tows
1. AKE	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-	-
4. SOE	-	-	-	-	-	-	-
5. SOU	-	-	-	-	-	-	-
6. SUB	488	488	100.0	7	1.4	10	2.0
7. CHA	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-
Total	**488**	**488**	**100.0**	**7**	**1.4**	**10**	**2.0**

Table 5 reports the numbers of interactions by species and life status immediately post interaction for the 2017/18 observer year. In comparison to the 2016/17 fishing year, observed interactions declined by 73%, mainly due to fewer New Zealand fur seal interactions (Hjorvarsdottir & Isaacs 2018). 82% of the observed interactions resulted in mortalities.

Table 5. Protected species interactions in the southern blue whiting fishery during the 2017/18 observer year.

Species Name	Alive	Dead	Grand Total
Birds			
Campbell albatross		1	1
Cape petrels	1		1
Grey petrel		2	2
Petrel (unidentified)		1	1
Southern royal albatross		1	1
Storm petrels	1		1
Birds Total	**2**	**5**	**7**
Marine Mammals			
New Zealand fur seal	1	9	10
Marine Mammals Total	**1**	**9**	**10**
Grand Total	**3**	**14**	**17**

Tables 6 a & b detail the broad method of interactions by species. Net capture was the most prevalent form of interaction with protected species (82% of interactions). 64% of the protected species interactions that resulted in mortalities were marine mammals.

Table 6. Method of interaction for a) protected species released alive and b) dead protected species observed in the southern blue whiting fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Grand Total
Birds			
Cape petrels	1		1
Storm petrels		1	1
Birds Total	**1**	**1**	**2**
Marine Mammals			
New Zealand fur seal	1		1
Marine Mammals Total	**1**		**1**
Grand Total	**2**	**1**	**3**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Grand Total
Birds			
Campbell albatross	1		1
Grey petrel	1	1	2
Petrel (unidentified)	1		1
Southern royal albatross		1	1
Birds Total	**3**	**2**	**5**
Marine Mammals			
New Zealand fur seal	9		9
Marine Mammals Total	**9**		**9**
Grand Total	**12**	**2**	**14**

Scampi

Observations in the scampi fishery are undertaken primarily to monitor interactions with seabirds and New Zealand sea lions. Historically, captures of seabirds by this fishery have been recorded in most areas, with known interactions of black petrels in AKE, Salvin's albatross in SOE and New Zealand sea lions in the SUB FMA.

Table 7 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. The observer coverage for the scampi fishery in the 2017/18 observer year increased by 21% from the previous observer year (2016/17). Observed tows were distributed between AKE, CEE, SOE, SUB, CHA and AKW FMAs, with the greatest number of tows recorded in SUB FMA.

Seabird interactions in this fishery increased in 2017/18, more than three times the 14 observed interactions in the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). There was only one marine mammal capture this year, in contrast to two in 2016/17. A substantial increase (219 kg) in coral bycatch occurred in comparison to 51 kg observed bycaught in the 2016/17 year, with the majority of the catch occurring on one trip in the SOE FMA. Bushy hard coral (*Goniocorella dumosa*) was the main species caught on this trip.

In summary, 11 observed trips were conducted on board seven vessels, with protected species interactions occurring on seven trips on board four vessels (64% of observed trips involved protected species interactions and 57% of these vessels had protected species interactions in 2017/18).

Table 7. Summary of commercial effort, observer effort and protected species interactions in the scampi fishery during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	814	76	9.3	3	3.9	-	-	-	-
2. CEE	712	0	-	-	-	-	-	-	-
3. SEC	-	-	-	-	-	-	-	-	-
4. SOE	1,483	185	12.5	17	9.2	-	-	219.0	117.3
5. SOU	7	0	-	-	-	-	-	-	-
6. SUB	1,553	255	16.4	25	9.8	1	0.4	0.1	0.04
7. CHA	26	0	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-	-	-
Total	**4,595**	**516**	**11.2**	**45**	**9**	**1**	**0.2**	**219.1**	**42.46**

Table 8 reports the number of interactions by species and life status immediately post interaction. The number of interactions leading to mortality was the same as the previous observer year (Hjorvarsdottir & Isaacs 2018), and all these instances were seabirds.

Table 8. Protected species interactions in the scampi fishery during the 2017/18 observer year.

Species Name	Alive	Dead	Decomposing	Unknown	Grand total
Birds					
Albatrosses (unidentified)	1	1			2
Black (Parkinson's) petrel	2				2
Southern Buller's albatross	5	1			6
Buller's albatross (unidentified)	1	5			6
Grey petrel		1			1
Northern Buller’s albatross	1				1
Prions (unidentified)	2				2
Salvin's albatross	5				5
Smaller albatrosses			1	1	2
Spotted shag	2				2
Storm petrels	1				1
White-capped albatross	6				6
White-faced storm petrel	2				2
White-headed petrel	7				7
Birds Total	**35**	**8**	**1**	**1**	**45**
Marine Mammals					
New Zealand sea lion			1		1
Marine Mammals Total			**1**		**1**
Grand Total	**35**	**8**	**2**	**1**	**46**

Tables 9 a & b detail the broad method of interactions for each species. The two decomposing species (a smaller albatross and a New Zealand sea lion) were net captures occurring in the SUB FMA during the same trip (spanning May/June 2018).

Table 9. Method of interaction for a) Protected species released alive and b) dead protected species observed in the scampi fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Tangled in line	Impact against vessel	Unknown	Other	Grand Total
Birds						
Albatrosses					1	1
Black (Parkinson's) petrel					2	2
Southern Buller's albatross		3			2	5
Buller's albatross (unidentified)			1			1
Northern Buller’s albatross			1			1
Prions (unidentified)			1	1		2
Salvin's albatross		1	4			5
Spotted shag	2					2
Storm petrels					1	1
White-capped albatross	1		1		4	6
White-faced storm petrel			2			2
White-headed petrel			7			7
Grand Total	**3**	**4**	**8**	**1**	**8**	**35**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Grand Total
Birds			
Albatrosses (unidentified)		1	1
Southern Buller's albatross	1		1
Buller's albatross (unidentified)	4	1	5
Grey petrel	1		1
Grand Total	**6**	**2**	**8**

Squid

Observer coverage in the squid trawl fishery is often higher than other trawl fisheries due to previous high interaction rates of New Zealand sea lions and seabirds. The majority of the past seabird interactions have been white-capped albatross, sooty shearwaters and white-chinned petrels and this trend continues into the current year. Being over 28m in length, all vessels in this fishery are legally required to deploy one of the three permitted types of seabird mitigation devices (tori line, warp scarer or bird baffler), industry defined codes of practice also apply and are monitored against by observers. Fish waste has been identified as a key issue leading to warp captures in this fishery. Vessel Management Plans have been developed to ensure each vessel has a specific plan to manage discharge of fish waste during fishing activity.

Particularly in the SQU6T area around the Auckland Islands (within the SUB FMA), the observer coverage is focused on recording New Zealand sea lion captures. Sea Lion Exclusion Devices (SLEDs) are used by all vessels operating in the SQU6T fishery. The majority of observer coverage in the squid fishery has been targeted at the SQU6T area, with high levels of coverage also being achieved in SOU as the vessels operate in this fishery enroute to and from SQU6T.

Seabird interactions in this fishery tend to vary between years dependent upon the spatial and temporal activity of vessels and its overlap with breeding seabirds, in particular, white-chinned petrels and sooty shearwaters.

Table 10 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. In comparison to 2016/17, the rate of seabird captures decreased by 8% (Hjorvarsdottir & Isaacs 2018). As with previous observer years, the majority of the seabird captures occurred in the SOU and SUB FMAs. The rate of mammal captures decreased by 14% from the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). The rate of coral catch decreased substantially from 1,026kg in 2016/17 to only 2.3 kg in 2017/18 (Hjorvarsdottir & Isaacs 2018). Five protected fish were bycaught in the squid fishery in 2017/18, equivalent to the amount caught the previous fishing year (2016/17) (Hjorvarsdottir & Isaacs 2018).

In summary, 59 observed trips were conducted on board 21 vessels, with protected species interactions occurring on 47 trips on 20 vessels (80% of observed trips involved protected species interactions and 95% of these vessels had protected species interactions in 2017/18).

Table 10. Summary of commercial effort, observer effort and protected species interactions in the squid fishery during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID.*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	-	-	-	-	-	-	-	-	-	-	-
2. CEE	-	-	-	-	-	-	-	-	-	-	-
3. SEC	341	212	62.2	5	2.4	6	2.8	-	-	1.2	0.57
4. SOE	91	91	100.0	-	-	1	1.1	-	-	-	-
5. SOU	1,206	1,157	95.9	120	10.4	5	0.4	1	1.0	0.5	0.04
6. SUB	1,150	996	86.6	152	15.3	6	0.6	4	4.6	0.6	0.06
7. CHA	-	-	-	-	-	-	-	-	-	-	-
8. CEW	-	-	-	-	-	-	-	-	-	-	-
9. AKW	-	-	-	-	-	-	-	-	-	-	-
Total	**2,788**	**2,456**	**88.1**	**277**	**11**	**18**	**0.7**	**5**	**0.2**	**2.3**	**0.09**

Table 11 reports the numbers of interactions by species and life status immediately post interaction. Similar to previous years, white-chinned petrels, white-capped albatross and sooty shearwaters accounted for a large part of the seabird interactions, with an increase in white-chinned petrel interactions compared to the previous observer year (51% more white-chinned petrel interactions than in 2016/2017) (Hjorvarsdottir & Isaacs 2018). In addition, the number of sooty shearwater interactions decreased markedly from the previous observer year, with only 20 recorded this observer year, in comparison to 101 in the 2016/17 observer year (80% decrease). Four white pointer shark captures occurred in the SUB and SOU FMAs between February and April 2018. The basking shark capture occurred in the SOI FMA.

Table 11. Protected species interactions in the squid fishery during the 2017/18 observer year.

Species Name	Alive	Dead	Decomposing	Unknown	Grand total
Birds					
Albatrosses (unidentified)	1	3			4
Antarctic prion	1				1
Southern Buller's albatross	9				9
Buller's albatross (unidentified)	1				1
Cape petrels				1	1
Common diving petrel		1			1
Crested penguins			1		1
Great albatrosses	2				2
Grey-backed storm petrel	1				1
Mid-sized Petrels & Shearwaters		1			1
Penguins	2				2
Petrel (unidentified)	2				2
Petrels, Prions and Shearwaters	5				5
Prions (unidentified)	1	1			2
Procellaria petrels	2	1			3
Salvin's albatross	5	3			8
Seabird - Small	1				1
Shearwaters	1	1			2
Shy albatross	1				1
Sooty shearwater	6	14			20
Storm petrels	1	1			2
Westland petrel	2				2
White-capped albatross	20	37	1		57
White-chinned petrel	40	105		1	146
White-headed petrel	1				1
Birds Total	**105**	**168**	**2**	**2**	**277**
Marine Mammals					
New Zealand fur seal		14			14
New Zealand sea lion		3			3
Whale (unspecified)		1			1
Marine Mammals Total	**5**	**18**			**23**
Protected Fish					
Basking shark	1				1
White pointer shark	4				4
Protected Fish Total	**5**				**5**
Grand Total	**115**	**186**	**2**	**2**	**305**

Tables 12a, b and c detail the broad method of interactions for each species. Net capture was the most prevalent form of interaction and 64% of these interactions resulted in mortalities. Fourteen seabird interactions were recorded as 'other', with the majority of these landing on deck and released alive.

Table 12. Method of interaction for a) Protected species released alive, b) Dead protected species and c) Decomposing protected species in the squid fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Caught on warp/ door	Impact against vessel	Other	Grand Total
Birds					
Albatrosses (unidentified)				1	1
Antarctic prion				1	1
Southern Buller's albatross	9				9
Buller's albatross (unidentified)	1				1
Great albatrosses	2				2
Grey-backed storm petrel				1	1
Penguins				2	2
Petrel (unidentified)	2				2
Petrels, Prions and Shearwaters	5				5
Prions (unidentified)				1	1
Procellaria petrels		1		1	2
Salvin's albatross	5				5
Seabird – Small				1	1
Shearwaters	1				1
Shy albatross	1				1
Sooty shearwater	6				6
Storm petrels	1				1
Westland petrel	1			1	3
White-capped albatross	15		1	4	20
White-chinned petrel	39			1	40
White-headed petrel	1				1
Birds Total	**89**	**1**		**14**	**105**
Protected Fish					
White pointer shark	4				4
Basking shark	1				1
Fish Total	**5**				**5**
Grand Total	**94**	**1**	**1**	**14**	**110**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Impact against vessel	Other	Unknown	Grand Total
Birds						
Albatrosses (unidentified)	2			1		3
Common diving petrel				1		1
Mid-sized Petrels & Shearwaters	1					1
Prions (unidentified)	1					1
Procellaria petrels	1					1
Salvin's albatross	2		1			3
Shearwaters	1					1
Sooty shearwater	13				1	14
Storm petrels				1		1
White-capped albatross	25	12				37
White-chinned petrel	102	3				105
Birds Total	**148**	**15**		**3**	**1**	**168**
Marine Mammals						
New Zealand fur seal	13			1		14
New Zealand sea lion	3					3
Whale (unspecified)	1					1
Marine Mammals Total	**17**			**1**		**18**
Grand Total	**165**	**15**	**1**	**4**	**1**	**186**

c) Decomposing protected species

Species	Caught in net	Grand Total
Birds		
Crested penguins	1	1
White-capped albatross	1	1
Birds Total	**2**	**2**
Grand Total	**2**	**2**

Pelagic Trawl Fisheries

Jack Mackerel and Barracouta

In previous years, common dolphins have been captured in the pelagic trawl fishery and in some instances multiple capture events have occurred. A Marine Mammal Operating Procedure (MMOP)[5] has been developed by industry to reduce marine mammal captures. These practices include not setting or hauling at certain times of the day in certain areas, a watch being kept for dolphins in the vicinity of fishing operations, management of trawl gear whilst turning (in order to close off the mouth of the net) and not setting while dolphins are present close to the vessel. All the vessels in this fishery are larger than 28m and are required by law to deploy bird capture mitigation devices.

Table 13 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. Commercial effort in this fishery increased 20% on the previous year (2016/17) (Hjorvarsdottir & Isaacs, 2018). The observer coverage levels in this fishery remained consistent with the previous observer year (2016/17) (Hjorvarsdottir & Isaacs, 2018), with the highest number of observed tows in CHA, SEC and CEW FMAs.

The number of seabird interactions decreased by 27% in the 2017/18 observer year in comparison to the previous year (2016/17) and the rate of mammal captures remained the same as the previous year, with eight recorded captures.

In summary, 66 observed trips were conducted onboard 20 vessels, with protected species interactions occurring on 22 trips on board 11 vessels (33% of observed trips involved protected species interactionsand 55% of vessels had protected species interactions in 2017/18).

Table 13. Summary of commercial effort, observer effort and protected species interactions in the jack mackerel and barracouta pelagic trawl fishery during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID.*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Mammal captures	Mammals /100 tows	Protected fish captures	Protected fish /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	6	-	-	-	-	-	-	-	-	-	-
2. CEE	48	-	-	-	-	-	-	-	-	-	-
3. SEC	2,143	566	26.4	5	0.9	3	0.5		-	-	-
4. SOE	215	111	51.6	3	2.7	-	-		-	5.0	4.5
5. SOU	401	375	93.5	25	6.7	-	-	-	-	0.1	0.03
6. SUB	-	-	-	-	-	-	-	-	-	-	-
7. CHA	1,250	791	63.3	1	0.1	3	0.4	1	0.1	1.1	0.14
8. CEW	589	511	86.8	1	0.2	2	0.4	-	-	-	-
9. AKW	123	141	114.6	3	2.1	-	-	-	-	-	-
Total	**4,775**	**2,495**	**52.3**	**38**	**1.5**	**8**	**0.3**	**1**	**0.04**	**6.2**	**0.25**

[5] Deepwater marine mammal operating procedure available here: https://deepwatergroup.org/wp-content/uploads/2018/11/MMOP-Version-9-2.pdf

Table 14 reports the number of interactions by species and life status immediately post interaction. Sooty shearwaters were the most commonly seabird interaction. Common dolphin captures, as seen this year, have occurred in three of the past four observer years (2013/14, 2014/15 and 2015/16) (Clemens-Seely & Hjorvarsdottir 2016, Hjorvarsdottir 2016, Hjorvarsdottir 2017). New Zealand fur seals were the most common marine mammal with observed captures; with all of these captures resulting in mortalities.

Table 14. Protected species interactions in the jack mackerel and barracouta pelagic trawl fisheries during the 2017/18 observer year.

Species Name	Alive	Dead	Grand total
Birds			
Southern Buller's albatross		5	5
Common diving petrel		2	2
Fairy prion	1		1
Petrel (unidentified)	2		2
Prions (unidentified)	4		4
Sooty shearwater	3	9	12
Storm petrels	2	1	3
White-capped albatross	3	2	5
White-chinned petrel		4	4
Birds Total	**15**	**22**	**38**
Marine Mammals			
New Zealand fur seal		7	7
Common dolphin		1	1
Marine Mammals Total		**8**	**8**
Protected Fish			
White pointer shark		**1**	**1**
Protected Fish Total		**1**	**1**
Grand Total	**15**	**32**	**47**

Table 15a and b detail the broad method of interaction for each species. Net capture was the most prevalent form of interaction overall and was responsible for 91% of the interactions that resulted in mortalities. The majority of interactions that lead to mortality involved seabirds and 39% of these were sooty shearwater interactions.

Table 15. Method of interaction for a) protected species released alive and b) dead protected species observed in the jack mackerel and barracouta pelagic trawl fisheries during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Other	Grand Total
Birds				
Fairy prion		1		1
Petrel (unidentified)		1	1	2
Prions (unidentified)		1	3	4
Sooty shearwater	1		2	3
Storm petrels		2		2
White-capped albatross	3			3
Grand Total	**4**	**5**	**6**	**15**

b) Dead protected species

Species	Caught in net	Caught in warp door	Unknown	Other	Grand Total
Birds					
Southern Buller's albatross	4	1			5
Common diving petrel	1			1	2
Sooty shearwater	8		1		9
Storm petrels	1				1
White-capped albatross	2				2
White-chinned petrel	4				4
Birds Total	**20**	**1**	**1**	**1**	**23**
Marine Mammals					
Common dolphin	1				1
New Zealand fur seal	7				7
Marine Mammals Total	**8**				**8**
Protected Fish					
White pointer shark	1				1
Protected Fish Total	**1**				**1**
Grand Total	**29**	**1**	**1**	**1**	**32**

Deep Water Bottom Trawl Fisheries

Orange Roughy, Cardinal and Oreo Species

This trawl fishery spans all FMAs and also takes place in areas outside of the NZ EEZ. In deep water bottom trawl fisheries, one of the main focuses of observer coverage is to describe the impact of the trawls on benthic communities, more specifically protected corals. Seabird behaviour and abundance are also monitored around the vessels in this fishery. Discards and offal management, as well as the mandatory use of bird scaring devices, are employed by the fleet to mitigate seabird interactions.

Table 16 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. There was a slight decrease (5%) in fishing effort in this fishery over the past year and similar observer coverage in the orange roughy, cardinal, and oreo deep water bottom trawl fisheries to the previous observer year (2016/17) (Hjorvarsdottir & Isaacs, 2018).

Seabird captures increased in 2017/18, with 11 observed interactions occurring in comparison to two in the 2016/17 observer year (Hjorvarsdottir & Isaacs, 2018). The rate of coral bycatch for this observer year reduced to 327 kg/100 tows, in comparison to 746 kg/100 tows in 2016/17 (Hjorvarsdottir & Isaacs, 2018). The overall coral bycatch decreased in the current observer year by 58% from the previous observer year (Hjorvarsdottir & Isaacs, 2018). The majority of the coral catch was bushy hard coral (*Goniocorella dumosa*), mainly coming from the SOU FMA.

In summary, 42 observed trips were conducted onboard 15 vessels, with protected species interactions occurring on 14 trips on board seven vessels (33% of observed trips involved protected species interactions and 47% of vessels had protected species interactions in 2017/18).

Table 16. Summary of commercial effort, observer effort and protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	74	41	55.4	0	0.0	1.4	3.4
2. CEE	574	86	15.0	1	1.2	18.0	20.9
3. SEC	507	129	25.4	0	0.0	3.1	2.4
4. SOE	2,014	214	10.6	6	2.8	5.7	2.7
5. SOU	134	67	50.0	0	0.0	2,039.0	3,043.28
6. SUB	458	347	75.8	0	0.0	1,594.3	459.45
7. CHA	293	189	64.5	3	1.6	3.3	1.75
8. CEW	4	4	100.0	0	0.0	0.0	0.00
9. AKW	276	46	16.7	1	2.2	2.8	6.09
Total	**4,334**	**1,123**	**25.9**	**11**	**1.0**	**3,667.6**	**326.59**

Table 17 reports the number of interactions by species and life status immediately post interaction. The majority (82%) of seabirds were released alive.

Table 17. Protected species interactions in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2017/18 observer year.

Species Name	Alive	Dead	Grand total
Birds			
Albatrosses (unidentified)	1		1
Cape petrels	1		1
Common diving petrel	1		1
Petrels, Prions and Shearwaters	1		1
Salvin's albatross		1	1
Sooty Shearwater	1		1
Wandering albatross (unidentified)	2		2
Westland petrel	1		1
White-capped albatross	1	1	2
Grand Total	**9**	**2**	**11**

Tables 18a and b detail the broad method of interaction for each species. 45% of seabird captures were caught in the net and 80% of these incidences were released alive.

Table 18. Method of interaction for a) protected species released alive and b) dead protected species observed in the orange roughy, cardinal and oreo deep water bottom trawl fisheries during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Other	Grand Total
Birds				
Albatrosses (unidentified)		1		1
Cape petrels			1	1
Common diving petrel			1	1
Petrels, Prions and Shearwaters		1		1
Sooty shearwater	1			1
Wandering albatross (unidentified)	2			2
Westland petrel			1	1
White-capped albatross	1			1
Grand Total	**4**	**2**	**3**	**9**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Grand Total
Birds			
Salvin's albatross	1		1
White-capped albatross		1	1
Grand Total	**1**	**1**	**2**

Inshore Fisheries

Inshore Trawl

Inshore fishing within the New Zealand EEZ is a very diverse activity, with large variations in methods, individual practice and effort. In the case of trawl and bottom longline fisheries, it becomes difficult to draw a simple distinction between the inshore and offshore sectors, as a number of vessels make seasonal shifts across sectors. Individual vessels can range in size from 2-30m or more. Equally, activity can range from 20 days per year to over 300 for each vessel. Overly simplified characterisation of the inshore sector is problematic and may lead to false conclusions about the fishery. Therefore, it is critical when gathering information on the inshore fishing sector to get as broad and representative coverage as possible.

Observer coverage of inshore fisheries has historically been low due to the inherent difficulties of placing observers on small vessels in remote ports. Additionally, many of the fishers only operate part time, either seasonally or sporadically. As a result, observers may often spend much of their time on shore or travelling between ports.

Table 22 presents a summary of commercial fishing effort, observer effort and protected species interactions in the inshore trawl fishery during the 2017/18 observer year. Coverage increased slightly in 2017/18 observer year, with an overall coverage of 5.9%, in comparison to 4.3% in the 2016/17 observer year (Hjorvarsdottir & Isaacs, 2018). Observer coverage in the AKW FMA increased (34% more observed tows than in 2016/17), accounting for 77% of the overall observed tows across all FMAs in this fishery.

Seabird interactions increased greatly to 55 in 2017/18 in comparison to four interactions observed in 2016/17 (Hjorvarsdottir & Isaacs 2018). Five marine mammal captures occurred in 2017/18 in comparison to only one capture in 2016/17 (Hjorvarsdottir & Isaacs 2018). One protected fish capture occurred in 2017/18 in the AKW FMA.

In summary, 62 observed trips were conducted onboard 22 vessels, with protected species interactions occurring on 13 trips on board eight vessels (21% of observed trips involved protected species interactions and 36% of these vessels had protected species interactions in 2017/18).

Table 22. Summary of the commercial effort, observer effort and protected species captures in the inshore trawl fisheries during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Marine mammal captures	Marine mammals /100 tows	Protected fish captures	Protected fish /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	3,702	243	6.6	19	7.8	4	1.6	0	0.0	1.0	0.4
2. CEE	6,734	23	0.3	0	0.0	0	0.0	0	0.0	0.0	0.0
3. SEC	9,841	78	0.8	6	7.7	1	1.3	0	0.0	0.0	0.0
4. SOE	18	2	11.1	0	0.0	0	0.0	0	0.0	0.0	0.0
5. SOU	3,585	22	0.6	0	0.0	0	0.0	0	0.0	0.0	0.0
6. SUB	0	-	-	-	-	-	-	-	-	-	-
7. CHA	9,811	0	0.0	-	-	-	-	-	-	-	-
8. CEW	1,750	129	7.4	0	0.0	0	0.0	0	0.0	0.0	0.00
9. AKW	1,902	1,692	89.0	30	1.8	0	0.0	1	0.1	4.1	0.24
Total	**37,343**	**2,189**	**5.9**	**55**	**2.5**	**5**	**0.2**	**1**	**0.05**	**5.1**	**0.23**

Table 23 reports the number of interactions by species and life status immediately post interaction. All marine mammal captures resulted in mortalities, whilst the majority (89%) of protected seabird interactions were recovered and released alive. Overall, 82% of protected species interactions within this fishery did not lead to mortalities. The Southern Buller's albatross classified as having an unknown fate was recorded as such as the observer on board who did not personally witness the interaction. The captain informed the observer that the bird fell off the net as it was being hauled and appeared to be dead.

Table 23. Protected species interactions in the inshore trawl fisheries during the 2017/18 observer year.

Species	Alive	Dead	Unknown	Grand Total
Birds				
Black (Parkinson's) petrel	2			2
Southern Buller's albatross			1	1
Buller's shearwater	1			1
Common diving petrel	4			4
Fairy prion	5			5
Flesh-footed shearwater	2	1		3
Grey-faced petrel	12			12
Mid-sized Petrels & Shearwaters	1			1
Petrels, Prions and Shearwaters	15			15
Prions (unidentified)	1			1
Salvin's albatross	2	1		3
Smaller albatrosses		1		1
Storm petrels	2			2
White-capped albatross		1		1
White-chinned petrel		1		1
White-faced storm petrel	2			2
Birds Total	**49**	**5**	**1**	**55**
Marine Mammals				
Common dolphin		3		3
New Zealand fur seal		2		2
Marine Mammals Total		**5**		**5**
Protected Fish				
White pointer shark	1			1
Protected Fish Total	**1**			**1**
Grand Total	**50**	**10**	**1**	**61**

Table 24a and b detail the broad method of interaction for each species. 64% of interactions in this fishery involved a protected species impacting against the fishing vessel e.g. deck strike, all of these animals were released alive post interaction.

Table 24. Method of interaction for a) protected species released alive and b) dead protected species observed in the inshore trawl fisheries during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Impact against vessel	Other	Unknown	Grand Total
Birds					
Black (Parkinson's) petrel		2			2
Buller's shearwater				1	1
Common diving petrel		4			4
Fairy prion		2	3		5
Flesh-footed shearwater	2				2
Grey-faced petrel		12			12
Mid-sized Petrels & Shearwaters		1			1
Petrels, Prions and Shearwaters		15			15
Prions (unidentified)		1			1
Salvin's albatross	2				2
Storm petrels			2		2
White-faced storm petrel		2			2
Birds Total	**4**	**39**	**5**	**1**	**49**
Protected Fish					
White pointer shark	1				1
Protected Fish Total	**1**				**1**
Grand Total	**5**	**39**	**5**	**1**	**50**

b) Dead protected species

Species	Caught in net	Caught on warp or door	Grand Total
Birds			
Flesh-footed shearwater	1		1
Salvin's albatross		1	1
Smaller albatrosses	1		1
White-capped albatross		1	1
White-chinned petrel		1	1
Birds Total	**2**	**3**	**5**
Marine Mammals			
Common dolphin	3		3
New Zealand fur seal	2		2
Marine Mammals Total	**5**		**5**
Grand Total	**7**	**3**	**10**

Inshore Setnet

Setnet fisheries have received low levels of observer coverage due to the difficulty of placing observers on board these generally small vessels (2-19m). However, in recent years increased monitoring has occurred in some areas, driven by Threat Management Plans for Hector's and Māui dolphins and monitoring of risk to penguin species. Interactions with a number of protected species have been reported in the past, including Hector's (and other) dolphins, yellow-eyed (and other) penguins, , shags, sooty shearwaters, Westland petrels and protected sharks. Setnet is one of the few fisheries, like inshore trawl, conducted by vessels under 28m, which do not have any regulated mitigation device requirements. As with inshore trawl, coastal spatial closures (i.e. areas where setnetting is prohibited) have been put in place to reduce the risk of interaction with Hector's and Māui dolphins.

Observer coverage was initially low in this fishery but increased in 2008/09 due to concern around Hector's dolphin captures. However, in recent years, the coverage has dropped again due to other priorities, such as observer coverage of inshore trawling on the west coast of the North Island and black petrel interactions in the Hauraki Gulf.

Table 25 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. Fishing effort in 2017/18 reduced 42% from the 2016/17 fishing year, observer coverage remained similar. In comparison to the previous observer year (2016/17), the rate of seabird captures decreased by 8% to 22 observed seabird interactions in 2017/18, all occurring in the SEC and SOU FMAs. The number of mammal captures increased slightly from six captures in the 2016/17 observer year (Hjorvarsdottir & Isaacs 2018) to eight observed captures in 2017/18. As with the previous year, one protected fish species was also caught.

In summary, 24 observed trips were conducted onboard 14 vessels, with protected species interactions occurring on 12 trips onboard eight vessels (50% of observed trips involved protected species interactions and 57% of these vessels had protected species interactions in 2017/18).

Table 25. Summary of commercial effort, observer effort and protected species interactions in the inshore setnet fishery during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Sets	Observed Sets	Coverage (%)	Seabird interactions	Seabirds /100 sets	Marine mammal captures	Marine mammals /100 sets	Protected fish captures	Protected fish /100 sets	Coral catch (kg)*	Coral catch /100 sets
1. AKE	5,139	0	0.0	-	-	-	-	-	-	-	-
2. CEE	758	0	0.0	-	-	-	-	-	-	-	-
3. SEC	2,915	253	8.7	19	7.5	1	0.4	0	0.0	0	0
4. SOE	1	0	0.0	-	-	-	-	-	-	-	-
5. SOU	596	113	19.0	3	2.7	7	6.2	1	0.9	0.8	0.7
6. SUB	1	0	0.0	-	-	-	-	-	-	-	-
7. CHA	632	0	0.0	-	-	-	-	-	-	-	-
8. CEW	967	129	13.3	0	0.0	0	0.0	0	0.0	0.0	0.00
9. AKW	5,107	0	0.0	-	-	-	-	-	-	-	-
Total	**16,116**	**495**	**3.1**	**22**	**4.4**	**8**	**1.6**	**1**	**0.2**	**0.8**	**0.16**

Table 26 reports the number of interactions by species and life status immediately post interaction. Overall, the total amount of protected species interactions and life status of the animals are relatively similar to the 2016/17 observer year (Hjorvarsdottir & Isaacs, 2018). 64% of protected species interactions in 2017/18 resulted in the mortality of the species involved. White-chinned petrels comprised 54% of seabird interactions with 50% of these resulting in mortality. Two species of nationally vulnerable penguins were caught in the 2017/18 observer year, three yellow-eyed penguins were caught on three separate trips in the SEC and SOU FMAs and one Fiordland crested penguin in the SOU FMA, all instances resulted in mortalities. Twice the amount of fur seal captures occurred in 2017/18 in comparison to the 2016/17 observer year (Hjorvarsdottir & Isaacs, 2018).

Table 26. Protected species interactions in the inshore setnet fishery during the 2017/18 observer year.

Species	Alive	Dead	Grand Total
Birds			
Cape petrels	1		1
Fiordland crested penguin		1	1
Salvin's albatross	1		1
Sooty shearwater		1	1
Spotted shag		1	1
White-capped albatross	2		2
White-chinned petrel	6	6	12
Yellow-eyed penguin		3	3
Birds Total	**10**	**12**	**22**
Marine Mammals			
New Zealand fur seal		8	8
Marine Mammals Total		**8**	**8**
Protected Fish			
White pointer shark	1		1
Protected Fish Total	**1**		**1**
Grand Total	**11**	**20**	**31**

Tables 27a and b detail the broad method of interaction for each species. Net capture accounted for 74% of interactions, with 87% of these interactions resulting in mortality of the species involved.

Table 27. Method of interactions for a) protected species released alive and b) dead protected species observed in the setnet fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught in net	Other	Grand Total
Birds			
Cape petrels	1		1
Salvin's albatross		1	1
White-capped albatross		2	2
White-chinned petrel	1	5	6
Birds Total	**2**	**8**	**10**
Protected Fish			
White pointer shark	1		1
Protected Fish Total	**1**		**1**
Grand Total	**3**	**8**	**11**

b) Dead protected species

Species	Caught in net	Grand Total
Birds		
Fiordland crested penguin	1	1
Sooty shearwater	1	1
Spotted shag	1	1
White-chinned petrel	6	6
Yellow-eyed penguin	3	3
Birds Total	**12**	**12**
Marine Mammals		
New Zealand fur seal	8	8
Marine Mammals Total	**8**	**8**
Grand Total	**20**	**20**

Surface Longline Fisheries

Domestic Tuna and Swordfish

The domestic tuna and swordfish fishery (targeting bigeye, southern bluefin and swordfish) has historically had low levels of observer coverage. This is primarily due to the inherent difficulties in placing observers on these small vessels, which generally work irregular patterns. Consequently, data on this fleet's interactions with protected species are poor. Southern bluefin tuna, bigeye tuna and swordfish were introduced into the quota system at the start of the 2004/05 fishing year. After a large capture event in November 2006, regulations were put in place requiring departure notices and seabird mitigation use (deployment of a streamer line and either line weighting or night setting). CSP has also distributed turtle de-hookers to aid in the quick and efficient release of not only turtles but fur seals and a number of shark species also.

Table 28 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. The amount of observed lines in the domestic tuna and swordfish fishery decreased by 22% in 2017/18 in comparison to the previous observer year (2016/17) (Hjorvarsdottir & Isaacs, 2018). The highest amount of effort and observed lines in the 2017/18 observer year occurred in the AKE FMA.

Seabird interactions increased by 22% from 54 in 2016/17 (Hjorvarsdottir & Isaacs 2018), to 66 seabird interactions observed in 2017/18. The number of mammal captures increased by 18% from 22 observed captures in the 2016/17 observer year to 26 this year. In addition, four protected fish and four marine reptile captures were observed this year, more than the previous year (2016/17).

In summary, 19 observed trips were conducted onboard 17 vessels, with protected species interactions occurring on 15 trips aboard 13 vessels (79% of observed trips involved protected species interactions and 76% of these vessels had protected species interactions in 2017/18).

Table 28. Summary of commercial effort, observer effort and protected species interactions in the domestic tuna and swordfish fishery during the 2017/18 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird interactions	Seabirds /1000 hooks	Marine mammal captures	Marine mammals /1000 hooks	Protected fish captures	Protected fish /1000 hooks	Marine Reptile captures	Marine Reptiles /1000 hooks
1. AKE	1,155	120	10.4	106,730	18	0.2	3	0.03	2	0.02	2	0.02
2. CEE	709	64	9.0	62,374	2	0.05	13	0.2	0	0	2	0.03
3. SEC	51	0	0.0	-	-	-	-	-	-	-	-	-
4. SOE	0	-	-	-	-	-	-	-	-	-	-	-
5. SOU	15	3	20.0	2,400	6	2.5	1	0.4	0	0	0	0.0
6. SUB	0	-	-	-	-	-	-	-	-	-	-	-
7. CHA	414	63	15.2	60,830	38	0.6	9	0.1	0	0.0	0	0.0
8. CEW	7	0	0.0	-	-	-	-	-	-	-	-	-
9. AKW	156	27	17.3	14,255	1	0.1	0	0.0	2	0.14	0	0.0
10. KER	15	0	-	-	-	-	-	-	-	-	-	-
Total	**2,522**	**277**	**11.0**	**246,589**	**66**	**0.3**	**26**	**0.1**	**4**	**0.004**	**4**	**0.02**

Table 29 reports the number of interactions by species and life status immediately post interaction. The number of interactions this observer year increased by 25% to 99 interactions, in comparison to 79 from the 2016/17 observer year (Hjorvarsdottir & Isaacs 2018). White-capped albatross were the most commonly protected species interacted with in the 2017/18 observer year (29% of all interactions). New Zealand fur seals were the second most commonly caught species overall (24% of all interactions) and the most common marine mammal caught. An unidentified beaked whale appeared heavily tangled in line on a trip within the AKE FMA, the animal became disentangled without assistance and the fate of the animal was unknown. Overall, 59% of protected species interactions resulted in mortalities.

Table 29. Protected species interactions in the domestic tuna and swordfish fishery during the 2017/18 observer year.

Species	Alive	Dead	Unknown	Grand Total
Birds				
Black (Parkinson's) petrel		9		9
Southern Buller's albatross	1	10		11
Buller's albatross (unidentified)		1		1
Flesh-footed shearwater	1	2		3
Grey-faced petrel	2			2
Mid-sized Petrels & Shearwaters		1		1
Northern royal albatross		1		1
Procellaria petrels		4		4
Royal albatrosses	1	2		3
Storm petrels	1			1
White-capped albatross	2	27		29
Birds Total	**8**	**57**		**65**
Marine Mammals				
New Zealand fur seal	22	2		24
Beaked whales			1	1
Pilot whale	1			1
Marine Mammals Total	**23**	**2**	**1**	**26**
Protected Fish				
Spine-tailed devil ray	3			3
Oceanic whitetip shark	1			1
Protected Fish Total	**4**			**4**
Reptiles				
Green turtle	1			1
Leatherback turtle	2			2
Loggerhead turtle	1			1
Reptiles Total	**4**			**4**
Grand Total	**39**	**59**	**1**	**99**

Table 30a and b detail the broad method of interaction for each species. Three of the four reptile captures occurred on the same trip in the AKE and CEE FMAs, an additional Leatherback turtle was caught on a different trip in the CEE FMA. Hook capture was the most prevalent form of interaction, with 62% of these resulting in mortalities. The number of interactions leading to mortality by hook capture increased by 115%, in comparison to the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018).

Table 30. Method of interaction for a) protected species released alive, and b) dead protected species observed in the domestic tuna and swordfish fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught on hook	Other	Grand Total
Birds			
Southern Buller's albatross	1		1
Flesh-footed shearwater	1		1
Grey-faced petrel		2	2
Royal albatrosses	1		1
Storm petrels		1	1
White-capped albatross	2		2
Birds Total	**5**	**3**	**8**
Marine Mammals			
New Zealand fur seal	22		22
Pilot whale	1		1
Marine Mammal Total	**23**		**23**
Protected Fish			
Spine-tailed devil ray	3		3
Oceanic whitetip shark	1		1
Protected Fish Total	**4**		**4**
Reptiles			
Green turtle	1		1
Leatherback turtle	2		2
Loggerhead turtle	1		1
Reptile Total	**4**		**4**
Grand Total	**36**	**3**	**39**

b) Dead protected species

Row Labels	Caught on hook	Tangled in line	Grand Total
Birds			
Black (Parkinson's) petrel	8	1	9
Southern Buller's albatross	10		10
Buller's albatross (unidentified)	1		1
Flesh-footed shearwater	2		2
Mid-sized Petrels & Shearwaters	1		1
Northern royal albatross	1		1
Procellaria petrels	4		4
Royal albatrosses	2		2
White-capped albatross	27		27
Birds Total	**56**	**1**	**57**
Marine Mammals			
New Zealand fur seal	2		2
Marine Mammals Total	**2**		**2**
Grand Total	**58**	**1**	**59**

Bottom Longline Fishery

Offshore Bottom Longline

The offshore bottom longline fishery is observed to monitor seabird and marine mammal interactions. A relatively small part of the fleet conducts a large amount of the fishing effort in terms of the overall hook set. Regulations on this fishery require the use of tori lines, limitations on fish waste discharge and either night-setting or line weighting. Other industry applied mitigation techniques include gas cannons and fish waste and used bait discard management.

Because of the high variety of vessels and fishing grounds in the bottom longline fisheries, a new characterisation has been applied since the 2014/15 annual research summary. In this new grouping, the offshore bottom longline fishery is characterised as: all bottom longline vessels over 34m in overall length, and all vessels between 20-34m in overall length that set over 5000 hooks per day.

Table 1 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. In comparison to the 2016/17 observer year, the observer coverage increased from 6.9% to 18% in 2017/18 with 38% more hooks observed overall (Hjorvarsdottir & Isaacs 2018). The number of seabird interactions observed in this fishery continued to decrease, with 18 observed interactions in 2017/18 in comparison to 27 in 2016/17 and 95 in 2015/16 (Hjorvarsdottir 2017; Hjorvarsdottir & Isaacs 2018).

In summary, nine observed trips were conducted onboard eight vessels, with protected species interactions occurring on five trips onboard four vessels. (55% of observed trips involved protected species interactions and 50% of these vessels had protected species interactions in 2017/18).

Table 31. Summary of commercial effort, observer effort and protected species interactions in the deep-sea bottom longline fishery during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird interactions	Seabirds /1000 hooks	Coral catch (kg)*	Coral catch /1000 hooks
1. AKE	0	-	-	-	-	-	-	-
2. CEE	287	0	0.0	-	-	-	-	-
3. SEC	317	194	61.2	1,146,224	17	0.015	23.2	0.020
4. SOE	1,267	214	16.9	1,707,326	1	0.001	7.2	0.004
5. SOU	101	4	4.0	12,337	-	-	-	-
6. SUB	730	121	16.6	1,119,900	0	-	8.2	0.007
7. CHA	267	3	1.1	18,000	0	-	0	-
8. CEW	10	0	-	-	-	-	-	-
9. AKW	0	-	-	-	-	-	-	-
Total	**2,979**	**536**	**18.0**	**4,003,787**	**18**	**0.004**	**38.6**	**0.010**

Table 32 reports the numbers of interactions by species and life status immediately post interaction. Excluding corals, there was a 33% decrease in the number of protected species interactions in comparison to the number of interactions in the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). White-chinned petrels accounted for 89% of all observed interactions in 2017/18.

Table 32. Protected species interactions in the offshore bottom longline fishery during the 2017/18 observer year

Species	Dead	Grand Total
Procellaria petrels	1	1
Westland petrel	1	1
White-chinned petrel	16	16
Grand Total	**18**	**18**

Tables 33a details the broad method of interaction for each species. Hook capture was the only observed form of interaction, with all protected species interactions resulting in mortality.

Table 33. Method of interaction for a) dead protected species in the offshore bottom longline fishery during the 2017/18 observer year.

a) Dead protected species

Species	Caught on hook	Grand Total
Procellaria petrels	1	1
Westland petrel	1	1
White-chinned petrel	16	16
Grand Total	**18**	**18**

Inshore Bottom Longline - Ling, Bluenose, Hāpuku, and Bass

As with other inshore fishing methods, observer coverage in the inshore bottom longline fishery has generally been limited. In the past, coverage has been focused at certain time periods in selected ports or regions. Mitigation techniques used and tested (to varying extents) in this fishery include; weighting regimes, night setting, use of tori lines and use of fish oil to deter birds. In April 2008, regulations on mitigation were introduced for all bottom longline vessels, covering night setting or line weighting, tori line, and offal/discard management.

Bottom longline vessels targeting the species assemblage of ling, bluenose, hāpuku and bass tend to fish over wide areas with fishing occurring in all FMAs and ranging from 'inshore' to the Chatham rise. These fishing grounds overlap with a number of protected species' ranges, including a number of petrel and albatross species.

Because of the high variety of vessels and fishing grounds in the bottom longline fisheries, a new characterisation was applied since the 2014/15 annual research summary. In this new grouping, the inshore bottom longline fishery is characterised as: all bottom longline vessels under 20m in overall length, and all vessels between 20-34m in overall length that set 5000 hooks or less per day.

Table 34 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. In comparison to the previous observer year (2016/17), the amount of observed lines decreased by 58% in 2017/18. The number of seabird captures decreased by 99%, with three captures observed this year compared with 328 from the previous year (a large 'deck strike' event of 284 common diving petrels occurred in 2016/17 whereby the birds departed the vessel with some assistance) (Hjorvarsdottir & Issacs 2018). Coral bycatch increased to 36kg compared to 9.5kg in the previous year (2016/17) and all bycatch was categorised as coral rubble. One marine mammal capture was observed in 2017/18, no mammal captures were observed in the year prior.

In summary, 15 observed trips were conducted onboard 14 vessels, with protected species interactions occurring on five trips onboard five vessels (33% of observed trips involved protected species interactions and 36% of these vessels had protected species interactions in 2017/18).

Table 34. Summary of commercial effort, observer effort and protected species interactions in the inshore bottom longline fisheries during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird interactions	Seabirds /1000 hooks	Marine mammal captures	Marine mammal /1000 hooks	Coral catch (kg)*	Coral catch /1000 hooks
1. AKE	928	30	3.2	52,050	2	0.038	-	-	-	-
2. CEE	2,520	45	1.8	17,864	0	-	-	-	-	-
3. SEC	422	3	0.7	9,422	0	-	-	-	-	-
4. SOE	384	4	1.0	10,000	0	-	-	-	36	3.6
5. SOU	335	17	5.1	57,106	0	-	1	0.018	-	-
6. SUB	0	-	-	-	-	-	-	-	-	-
7. CHA	572	33	5.8	113,191	0	-	-	-	-	-
8. CEW	520	15	2.9	23,357	0	-	-	-	-	-
9. AKW	614	18	2.9	25,000	1	0.040	-	-	-	-
Total	**6,295**	**165**	**2.6**	**307,990**	**3**	**0.010**	**1**	**0.003**	**36**	**0.1**

Table 35 reports the number of interactions by species and life status immediately post interaction. 75% of protected species interactions resulted in mortality.

Table 35. Protected species interactions in the inshore bottom longline fisheries during the 2017/18 observer year.

Species	Alive	Dead	Grand Total
Birds			
Black (Parkinson's) petrel	1	1	2
Flesh-footed shearwater		1	1
Birds total	**1**	**2**	**3**
Marine Mammals			
New Zealand fur seal		1	1
Marine Mammals Total		**1**	**1**
Grand Total	**1**	**3**	**4**

Table 36a details the method of interaction for each species. All protected species were caught on the hook in the 2017/18 observer year. The one protected species released alive (a black (Parkinson's) petrel) was also caught on the hook, crew followed correct procedure in freeing this bird.

Table 36. Method of interaction for a) dead protected species observed in the inshore bottom longline fisheries during the 2017/18 observer year.

a) Dead protected species

Species	Caught on hook	Grand Total
Birds		
Black (Parkinson's) petrel	1	1
Flesh-footed shearwater	1	1
Birds total	**2**	**2**
Marine Mammals		
New Zealand fur seal	1	1
Marine Mammals Total	**1**	**1**
Grand Total	**3**	**3**

Bottom Longline - Snapper

Throughout the past nine years, observer coverage has been irregular in the snapper fishery. Fluctuating between < 1% up to 8% (Hjorvarsdottir 2016). This fishery is predominantly conducted in the AKE FMA by vessels under 20m in length.

Table 37 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. In comparison to 2016/17, there was a slight decrease in fishing effort, observed lines and number of hooks in 2017/18 but overall coverage of the fishery increased slightly from 3.9% to 4.1%. In this observer year (2017/18), 14 seabird interactions were observed, in comparison to 35 in the 2016/17 observer year, equating to a 60% reduction. One protected fish capture occurred in December 2017 within the AKE FMA.

In summary, 14 observed trips were conducted onboard 13 vessels, with protected species interactions occurring on eight trips on eight vessels (57% of observed trips involved protected species interactions and 61% of these vessels had protected species interactions in 2017/18).

Table 37. Summary of commercial effort, observer effort and protected species interactions in the snapper bottom longline fishery during the 2017/18 observer year.

FMA	Effort lines	Observed lines	Coverage (%)	Number of hooks observed	Seabird interactions	Seabirds /1000 hooks	Protected fish captures	Protected fish /1000 hooks
1. AKE	4,189	129	3.1	277,950	7	1.0	1	0.004
2. CEE	1	0	-	-	-	-	-	-
3. SEC	0	-	-	-	-	-	-	-
4. SOE	0	-	-	-	-	-	-	-
5. SOU	0	-	-	-	-	-	-	-
6. SUB	0	-	-	-	-	-	-	-
7. CHA	26	0	-	-	-	-	-	-
8. CEW	51	43	84.3	53,302	7	0.1	0.0	0.0
9. AKW	47	7	14.9	7,500	0	0.0	0	0.0
Total	**4,314**	**179**	**4.1**	**338,752**	**14**	**0.041**	**1**	**0.003**

Table 38 reports the numbers of interactions by species and life status immediately post interaction. There was an 57% decrease in the number of interactions in comparison to the previous observer year (2016/17) (Hjorvarsdottir & Isaacs 2018). The majority (67%) of interactions resulted in mortalities.

Table 38. Protected species interactions in the snapper bottom longline fishery during the 2017/18 observer year.

Species	Alive	Dead	Grand Total
Birds			
Cape petrels		1	1
Flesh-footed shearwater	3	9	12
Sooty shearwater	1		1
Birds total	**4**	**10**	**14**
Protected fish			
White pointer shark	1		1
Protected fish total	**1**		**1**
Grand Total	**5**	**10**	**15**

Tables 39 a and b detail the broad method of interactions. 77% of protected species caught by hook did not survive. The white pointer shark was hooked through the pectoral fin and was quickly released alive by the crew.

Table 39. Method of interaction for a) protected species released alive and b) dead protected species observed in the snapper bottom longline fishery during the 2017/18 observer year.

a) Protected species released alive

Species	Caught on hook	Tangled in line	Grand Total
Birds			
Flesh-footed shearwater	1	2	3
Sooty shearwater	1		1
Birds total	**2**		**4**
Protected fish			
White pointer shark	1		1
Protected fish total	**1**		**1**
Grand Total	**3**	**2**	**5**

b) Dead protected species

Species	Caught on hook	Grand Total
Birds		
Cape petrels	1	1
Flesh-footed shearwater	9	9
Grand Total	**10**	**10**

Purse Seine Fisheries

Skipjack Tuna

In July 2011, the spine-tailed devil ray (*Mobula japanica*) and manta ray (*Manta birostris*) became fully protected under Schedule 7A of the Wildlife Act (1953). Since these two species of rays are caught in purse seine fisheries for tuna in New Zealand and worldwide, CSP observer coverage of the purse seine fishery began in the 2011/12 observer year. This season marks the seventh year of reported coverage of the purse seine fishery.

Table 40 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. The amount of observed tows decreased slightly in comparison to 2016/17 (3% less) though the overall observer coverage increased by 13.5% due to lower overall commercial effort in this fishery. Seabird and mammal interactions are mostly non-existent or very low in this fishery (Clemens-Seely et al. 2014, Clemens-Seely & Hjorvarsdottir, 2016, Hjorvarsdottir 2017, Hjorvarsdottir & Isaacs 2018). Once again, this observer year (2017/18) no seabird or mammal interactions were observed. However, eight captures of spine-tailed devil rays were observed, all in the AKE FMA, one more animal than in 2016/17 (Hjorvarsdottir & Isaacs 2018).

In summary, two observed trips were conducted onboard two vessels, with protected species interactions occurring on a single observed trip/vessel in 2017/18.

Table 40. Summary of commercial effort, observer effort and protected species interactions in the purse seine fishery during the 2017/18 observer year.

FMA	Effort tows	Observed tows	Coverage (%)	Protected fish captures	Protected fish /100 tows
1. AKE	120	28	23.3	8	28.571
2. CEE	0	-	-	-	-
3. SEC	0	-	-	-	-
4. SOE	0	-	-	-	-
5. SOU	0	-	-	-	-
6. SUB	0	-	-	-	-
7. CHA	17	15	88.2	0	-
8. CEW	29	11	37.9	0	-
9. AKW	21	13	61.9	0	-
Total	**187**	**67**	**35.8**	**8**	**119.403**

Table 41 reports the numbers of interactions by species and life status immediately post interaction, and the method of the interaction recorded. Net capture was the only method of interaction, and resulted in the live release of the animal in each case.

Table 41. Protected species interactions, and the method of interaction for species release alive in the purse seine fishery during the 2017/18 observer year.

Species	Alive	Grand Total
Protected fish		
Spine-tailed devil ray	8	8
Grand Total	**8**	**8**

Mackerel & Other

The purse seine fishery targeting English mackerel, jack mackerel, kahawai, pilchard, snapper, trevally and other minor species is observed independently from the purse seine fishery targeting skipjack tuna because of temporal differences in fishing seasons as well as some differences in fishing practices and net construction.

Table 42 presents a summary of commercial fishing effort and observer effort in this fishery during the 2017/18 observer year. The commercial fishing effort of the fishery was mainly carried out in the AKE FMA, although some fishing effort was conducted in CEE, SEC and AKW FMAs. There were 6 observed tows recorded in 2017/18 in the AKE FMA, 71% less than the amount in the 2016/17 observer year (Hjorvarsdottir & Isaacs 2018). No bycatch of protected species was observed in 2017/18 and no protected species interactions have occurred since reporting began on this proportion of purse seine fisheries.

In summary, only one observed trip was conducted onboard a single vessel, with no protected species interactions in 2017/18. Observer coverage of this fishery has historically been low.

Table 42. Summary of commercial effort, observer effort and protected species captures in the purse seine mackerel fishery during the 2017/18 observer year.

FMA	Effort tows	Observed tows	Coverage (%)
1. AKE	401	6	1.5
2. CEE	29	0	-
3. SEC	2	0	-
4. SOE	0	-	-
5. SOU	0	-	-
6. SUB	0	-	-
7. CHA	0	-	-
8. CEW	0	-	-
9. AKW	16	0	-
Total	**448**	**6**	**1.3**

Precision Seafood Harvesting (PSH)

PSH testing started in October 2012 and has been active every year since then. PSH uses a prototype harvesting system, called the Modular Harvest System or 'MHS', that aims to target specific species and fish sizes, as well as enabling fish to be landed in much better condition than traditional trawls. The method also opens the opportunity for holding and on-rearing live fish to enable fresh fish to be provided on demand. PSH uses a new system that replaces a part of the traditional trawl net with a flexible PVC landing liner which is dotted with escape portals, which is developed to increase the likelihood of undersized and non-target species escaping the net through these portals. Targeted fish then continue to swim at a natural pace, within the liner, until such time as they are landed.

Although PSH falls under the trawling sector, the technology used differs in fundamental ways, which could cause differences in the incidental capture rate of protected species, thus, observer reporting is carried out separately. This is the second year PSH has been reported on, so comparisons can only be made between 2017/18 and 2016/17 observer years at this stage.

Table 43 presents a summary of commercial fishing effort, observer effort and protected species interactions in the fishery during the 2017/18 observer year. The use of PSH in both mid and bottom trawl tows increased by 96% in the 2017/18 year, highlighting the uptake of the technology over the trawl fleet. The observer coverage in this fishery dropped 49.5% on the previous year (61% coverage 2016/17). Fishing effort occurred across all FMA's, with the highest fishing effort carried out in the AKE and CEE FMA's. Twenty-seven observed seabird interactions were recorded in the PSH fisheries in 2017/18, increasing from 21 in the previous year (a 29% increase). 19.6 kg of protected coral bycatch was observed in the 2017/18 observer year, a 76% reduction on the coral catch in 2016/17. The majority (65%) of the coral consisted of flabellum cup corals (*Flabellum* spp.). No marine mammal or protected fish captures occurred in the 2017/18 observer year.

In summary, 13 observed trips were conducted aboard five vessels, with protected species interactions occurring on four of these trips aboard a single vessel (31% of observed trips involved protected species interactions and 20% of these vessels had protected species interactions in 2017/18).

Table 43. Summary of commercial effort, observer effort and protected species interactions in the Precision Seafood Harvesting trawl fisheries during the 2017/18 observer year. **coral catch is based on raw observer ID not expert ID*

FMA	Effort Tows	Observed Tows	Coverage (%)	Seabird interactions	Seabirds /100 tows	Coral catch (kg)*	Coral catch /100 tows
1. AKE	2,428	268	11.0	0	0.0	5.8	2.2
2. CEE	935	120	12.8	0	0.0	0.0	0.0
3. SEC	115	4	3.5	0	0.0	0.0	0.0
4. SOE	255	7	2.7	0	0.0	0.0	0.0
5. SOU	22	0	-	-	-	-	-
6. SUB	26	0	-	-	-	-	-
7. CHA	116	14	12.1	0	0.0	0.0	0.0
8. CEW	21	0	-	-	-	-	-
9. AKW	621	109	17.6	27	24.8	13.8	12.66
Total	**4,539**	**522**	**11.5**	**27**	**5.2**	**19.6**	**3.75**

Table 44 reports the number of interactions by species and life status immediately post interaction. All observed interactions resulted in the live release of the animal involved, this is a substantial increase on the 53.8% of interactions involving live release in 2016/17 (Hjorvarsdottir & Isaacs 2018). Buller's shearwaters accounted for 33% of the protected species interactions in 2017/18, this also being a common species in the year prior (2016/17). All protected seabird species interactions occurred on a single trip with 85% of these occurring on the same day.

Table 44. Protected species interactions in the Precision Seafood Harvesting trawl fisheries during the 2017/18 observer year.

Species	Alive	Grand Total
Birds		
Buller's shearwater	9	9
Common diving petrel	3	3
Fluttering shearwater	2	2
Grey-faced petrel	2	2
Petrels, Prions and Shearwaters	4	4
Prions (unidentified)	1	1
White-faced storm petrel	6	6
Grand Total	**27**	**27**

Table 45 details the broad method of interactions, all protected species interactions were reported as impacts against the fishing vessel. All of these seabirds were found in or around the vessel and were suggested (by the observer) to have come on board while the vessel was at anchor overnight.

Table 45. Method of interaction for protected species observed in the Precision Seafood Harvesting trawl fisheries during the 2017/18 observer year.

Species	Impact against vessel	Grand Total
Birds		
Buller's shearwater	9	9
Common diving petrel	3	3
Fluttering shearwater	2	2
Grey-faced petrel	2	2
Petrels, Prions and Shearwaters	4	4
Prions (unidentified)	1	1
White-faced storm petrel	6	6
Grand Total	**27**	**27**

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $1,021,349. Services were provided by the Ministry for Primary Industries Observer Services.

References

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2.2 INT2015-03 Identification and storage of cold-water coral bycatch specimens

Overall objective

To identify coral bycatch that cannot be identified by Government fisheries observers to the finest taxonomic level (assign codes to coral specimens to the species level wherever possible, when this is not possible; identify specimens to genus or family level).

Specific objectives

1. To determine through expert examination, the taxa of unidentified cold-water corals returned by fisheries observers.
2. Record all identified coral specimens and make them available for appropriate taxonomic collections.
3. Ensure preparation of genetic samples of selected octocoral specimens (*Thouarella* sp. specifically *Thouarella crenlata*) is undertaken by taxonomic collection technicians during identification, in order to feed into planned coral connectivity work.
4. Formalise Fisheries Observer briefings with updated coral identification information.

Rationale

The 2010 amendment of Schedule 7A of the Wildlife Act 1953 protects all hard corals, including: black corals (all species in the order Antipatharia); gorgonian corals (all species in the order Alcyonacea (previously known as Order Gorgonacea)); stony corals (all species in the order Scleractinia); and hydrocorals (all species in the family Stylasteridae). Identifying coral bycatch that is unable to be identified by Government fisheries observers to the finest taxonomic level provides vital baseline information that can help to better inform research and marine protection such as predictive modelling, benthic risk assessments and management of benthic marine protected species.

The aim of this project is to improve the quality of data collection and protected coral identifications. Observer briefings can continue and be formalised, and Observers can be informed about how the research data are used. This will improve their skills at identifying and collecting samples and bycatch data. Specialists can then confirm identifications to help understand distributions at a more detailed taxonomic level. This work will also feed into planned coral connectivity research, which will enable more robust assessment of areas at risk from fisheries impacts.

Project status

This is a three-year term project that is due for completion in June 2019. The draft report for the 2017/18 year is now complete.

Summary of the methods and key findings

A total of 206 specimen samples, those collected during the reporting period as well as historical observer and research trawl survey specimen identifications, were identified to the lowest taxonomic level. Updates were then made to the Centralised Observer Database (*COD*). To meet the second project objective, a sub-sample of each live specimen is taken for future genetic analysis. Forty-nine coral tissue samples are now held in storage for future genetic studies.

Coral samples have been returned from both within the New Zealand Exclusive Economic Zone as well as the High Seas Fisheries Management Areas. Of the specimen samples received, and digital images processed, bottom trawling targeting deep-sea fish species has contributed to the highest counts of coral mortality. Coral by-catch samples were also returned from bottom long-line tows but in lower numbers.

Identification of protected corals from digital images provided by observers were possible for 277 protected coral images, 214 of which were able to be georeferenced. Efforts were made to use trip number and image properties (date, time), to help populate the data poor images with georeferenced information.

Recommendations

To ensure a greater degree of confidence in data quality and for significant gains in efficiency we recommend:

▪ That the instructions to Government Observers on methods to capture images at-sea (Tracey et al. 2017) need to be stressed via the MPI Observer Programme, with emphasis on including a label in the image when photographing the specimen with details of the station number/ tow number and if possible, that the station number be included in the image file name.

▪ The Observer programme provide the Observer with specimen labels and that they are consistently used when photographing the specimen.

▪ The Observer consistently highlight or tick 'image taken' on the benthic materials form.

▪ A discussion with CSP and MPI to improve the process of logging of station number information upon receipt of the digital images take place early 2019 to avoid having to reconstruct information from qualitative examination of Observer data.

▪ That the camera's time stamp be set correctly. This detail could be added to the Instructions to Observers document.

▪ Observers be given GPS-enabled cameras.

We do note that it can be difficult to reflect the time period accurately to match a station when photographs are taken. This is because the Observers may not always be able to take photos of the samples until after their shift ends or after some period of storage e.g., in a fridge or freezer, rather than immediately upon the collection of the specimen. If the time clock is set correctly however, then this will save time when interrogating databases and forms.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 per annum. Services are provided by NIWA.

Review milestones:

- Methodology presented at the CSP TWG meeting on 16 November 2016
- 2016/17 Final Annual Report made available on the CSP webpage on 22 November 2017
- 2017/18 Draft Final Annual Report made available on the CSP webpage on 10 December 2018

Citation

Tracey, D., Mills, S., Macpherson, D., Thomas, H. 2017. Identification and storage of cold-water coral bycatch specimens. Final Report prepared by NIWA for the Conservation Services Programme, Department of Conservation. INT2015-03. NIWA Client Report 2017349WN. 38 p.

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Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2016-17/identification-of-and-storage-of-cold-water-corals-final-annual-report/

https://www.doc.govt.nz/contentassets/9abc0c46cdd6469883b18916697ec855/int2015-03-coral-id-draft-annual-report.pdf

2.3 INT2016-02 Identification of seabirds captured in New Zealand fisheries

Overall objective

To determine which seabird species are captured in fisheries and the mode of their capture.

Specific objectives

1. To determine, through examination of returned seabird specimens, the taxon, sex, and where possible age-class and provenance of seabirds killed in New Zealand fisheries (for returned dead specimens).
2. To detail the injuries, body condition and stomach contents and, where possible, the likely cause of mortality (for returned dead specimens).
3. To report any changes in the protocol used for the necropsy of seabirds (for returned dead specimens).
4. To determine, through examination of photographs, the taxon and, where possible, sex, age-class and provenance of seabirds captured in New Zealand fisheries (for live captures or dead specimens discarded at sea).

Rationale

Large numbers of seabirds frequent New Zealand commercial fishing waters. Birds with significant differences in conservation status can appear morphologically similar. The accurate determination of the taxon of seabirds captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify seabirds at sea with high precision and the assessment of the age-class, sex and provenance of captured individuals requires autopsy in the majority of cases. Historically all dead seabird specimens collected by observers have been returned for necropsy where possible. However, in many cases, the taxon can be confirmed through expert examination of photographs taken by observers, and this can be achieved at lower cost than returning carcases and performing necropsy. In order to maximise cost efficiencies, and in recognition of increased observer coverage levels in some fleets, a new protocol has been developed to determine which specimens are returned for full necropsy. This protocol aims to strike a balance between returning birds for full necropsy (for rarer species and in less observed fisheries) and photographing birds for determination of taxon (for commonly caught species in well observed fisheries).

Examining the causes of mortality and types of injuries incurred by individual seabirds returned from fisheries is necessary to help reduce future seabird captures in New Zealand fisheries by identifying gear risks. Linking this information to species, age- and sex-class, and breeding status, helps identify if different groups of seabirds are vulnerable to different risks in fishing interactions.

Information gained through this project will link to Ministry for Primary Industries databases, seabird bycatch estimates, and will inform ongoing risk assessment, research and modelling of the effects of fisheries bycatch on seabird populations. Further, the mode of capture and associated information will enable robust analyses to be made of the factors contributing to seabird capture events and inform the development of appropriate mitigation strategies.

Project status

This is a three-year term project that is due for completion in June 2019. The final report for the 2017/18 year is now complete.

Summary of the methods and key findings

This summarises identification work completed on dead birds caught and returned and/or using photographs covering two reporting periods; (i) 1 July 2016 to 30 June 2017 and (ii) 1 July 2017 to 30 June 2018.

1 July 2016 to 30 June 2017:
A total of 193 seabirds (19 taxa) were returned from 46 vessels between 1 July 2016 and 30 June 2017. Seabirds returned were dominated by five species (Salvin's albatross, Buller's albatross, sooty shearwater, NZ white-capped albatross and white-chinned petrel). These accounted for 78.2% of all returns. All birds returned from longline fisheries had injuries consistent with hooks or entanglement in the bill, throat or wing. In contrast, most birds (79.4%) returned from trawl fisheries were killed in the net, cod-end or pound, with 10.7% killed by warp interaction. Four birds were killed by striking the deck of a vessel. Birds had higher mean fat scores than last year, and discards, including offal, appear to continue to attract seabirds. In addition to the seabirds returned autopsy, examination of the Ministry for Primary Industries Central Observer Database and images provided by Government observers gave a further 762 seabirds reported or photographed as interactions (both dead or live captures) with 60 fishing vessels. Over two-thirds (69.9%) of the seabirds reported in these interactions were released alive. Out of these 762 records of seabird interactions, photographs were taken of 252 seabirds consisting of 18 taxa.

1 July 2017 to 30 June 2018:
Between 1 July 2017 and 30 June 2018, a total of 251 seabirds comprising 22 taxa were returned from 17 longline (n = 97 birds), 30 trawl (n = 143 birds) and 5 set net (n = 11 birds) vessels and were dominated by six species (flesh-footed shearwater, Salvin's albatross, sooty shearwater, Buller's albatross, white-chinned petrel and NZ white-capped albatross. All birds returned from longline fisheries had injuries consistent with being hooked or entangled in the bill, throat or wing. In contrast, most birds (79.7%) returned from trawl fisheries were killed in the net, cod-end or pound, with 10.4% likely to have been killed by warp interaction. Four birds were killed by striking the deck of the vessel. Birds had a slightly higher mean fat scores than last year. Over 25% of birds had eaten discards or offal. In addition to the seabirds returned for autopsy, examination of the Ministry for Primary Industries Central Observer Database and images provided by Government observers gave a further 545 seabirds that were reported or photographed as interactions (both dead or live captures) with 57 fishing vessels. Two-thirds (66.6%) of the seabirds reported in these interactions were released alive. Out of these 545 seabird interactions, photographs were taken of 241 seabirds consisting of 19 taxa.

Image quality varied widely in both reporting periods, with poor images being particularly common for birds that were alive and seen aboard for short periods. Images for dead birds have improved with multiple images taken for each specimen. Recommendations are made to improve photo-identifications in the future.

Recommendations

Wherever possible, all seabird interactions should be photographed and recorded. If possible, haul and sample information should be included in the image. Images (with scale if possible) include the head and bill from the side and above, body (full body and side shots), wings (above and below) and shots of the feet whenever possible. This is particularly important for dead birds. Photo logs are completed for all images (which can be correlated to date and time stamps from the camera). Descriptions of the interaction would also help with the identification and matching of images. Photograph numbers are recorded on the observer non-fish bycatch form. Photographs (and extracts from the MPI observer log books) should be provided regularly throughout the fishing year for photo-identification.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000 per annum. Services are provided by WMIL.

Review milestones:

- Methodology report tabled on the CSP webpage on 16 November 2016
- 2016/17 Final annual report tabled on the CSP webpage on 15 December 2017
- 2017/18 Final annual report tabled on the CSP webpage on 22 November 2018

Citation

Bell, E.A. and Bell, M.D. 2017. INT2016-02 Identification of seabirds caught in New Zealand fisheries: 1 July 2016 to 30 June 2017. Annual Technical Report to the Conservation Services Programme, Department of Conservation. Wellington, New Zealand. 31 p.

Bell, E.A. and Bell, M.D. 2018. INT2016-02 Identification of seabirds caught in New Zealand fisheries: 1 July 2017 to 30 June 2018. Annual Technical Report to CSP, Department of Conservation, Wellington, NZ. 36 p.

Weblink

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https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2017-18/identification-of-seabirds-caught-in-nz-fisheries-2017-18/

2.4 INT2017-02 Supporting the utility of electronic monitoring to identify protected species interacting with commercial fisheries

Overall objective

To enable the optimal collection of protected species interaction data via electronic monitoring systems.

Specific objectives

1. Develop tools to aid in the effective identification of protected species from camera footage.
2. Provide training materials for remote viewers of fisheries data to enable the collection of robust data on the nature of interactions.

Rationale

Electronic monitoring through use of video and sensor data has been operated in a number of fisheries around the world for a variety of management needs. The utility of these systems for the monitoring of protected species interactions is dependent on robust, objective based planning and adequate investment in upskilling of footage reviewers. In New Zealand, the Ministry for Primary Industry's Integrated Electronic Monitoring and Reporting System (IEMRS) has set in place ambitious timelines for roll out throughout the New Zealand fishing fleets. Overall objectives of IEMRS are not limited to protected species monitoring. However, to ensure maximum utility and therefore value of the system, it will be critical that footage reviewers are adequately skilled in protected species identification and the nature of their interactions with fishing operations.

Project status

This is a multi-year project with phase 1 completed in 2017/18.

Summary of the methods and key findings

Monitoring commercial fisheries provides essential information to enable effective fisheries management. This project involved an extensive review investigating the types of threatened, endangered, and protected species (TEPS) interactions that electronic monitoring (EM) has been used to explore, and training given to analysts to detect and describe those interactions. The review encompassed published and unpublished reports, social media posts, and the websites of practitioners, companies, agencies, and multilateral bodies known to use or promote EM. Experts were also consulted directly to collect information on work that is underway but not yet publicly available.

The majority of EM programmes to date that have focused on TEPS interactions were trials or pilots, with a smaller number of operational programmes underway. Information reviewed showed that EM has been widely tested and proven effective in monitoring captures of a range of TEPS in fishing gears. When EM imagery captures these interactions, species identification is possible in most cases. Life status can also be determined when animals are vigorous, especially when brought on deck prior to release. Detection of unusual or unexplained behaviour, that may result from crews wishing to avoid a TEPS capture being recorded by EM, is also possible. EM has been explored (but found less effective) for monitoring seabird interactions with trawl warps and third wires.

Other effective applications of EM that are relevant to the impacts of fishing on TEPS include monitoring handling of these species after capture, deployment of mitigation devices (e.g. tori lines, pingers, turtle exclusion devices), and detecting the presence of fish waste discharge within camera views. Collecting robust quantitative information on the abundance of TEPS present in the air or in the water around vessels and fishing gear is difficult using EM.

Species identification using EM imagery has been approached by practitioners using a number of methods, e.g. employing analysts who are trained and work as at-sea observers or who have received observer training, using field guides, species lists, and images of species of interest. Characteristics such as body size, morphology, colour, and distinctive markings are all important to facilitate identifications.

In many reports and published papers, the training provided to EM analysts is not described. However, because EM analysts are the source of data, the training process has a strong bearing on data quality and therefore end-user confidence in datasets produced. In studies where training is described, it routinely incorporates elements such as core instruction, self-tests and practice runs after which feedback is provided, and a formal assessment that documents analyst competence. When a particular level of competence is reached in the formal assessment, this provides an assurance of a commensurate level of data quality.

The detection of interactions between TEPS and fishing gear occurs after a number of other steps in the EM process chain. For example, monitoring objectives and business requirements must be clearly defined, EM cameras must be deployed in appropriate positions on-vessel, system specifications (e.g. frame rate) must be optimised to record interactions, and crew activities onboard must occur such that these objectives and requirements can be addressed. Once EM imagery is captured, the review process provides for the extraction of data on TEPS. As part of a rigorous monitoring process, data extraction must be repeatable and auditable. However, the development of standards to underpin EM is in its early days.

Recommendations

- Data standards are developed and documented to specify the information that EM analysts are tasked with extracting from imagery
- Quality assurance standards are developed for EM review
- Training materials and programmes are prepared to enable EM analysts to populate data fields and to document their findings
- The development of training materials is initiated where requirements are already understood
- Photos and videos taken by fisheries observers are catalogued and stored for use as part of EM training materials and potentially for machine learning
- NZ remains abreast of the regional development of EM process and data standards
- Practitioners in NZ and internationally are encouraged to make available EM process and data standards, review protocols and training materials

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $20,000 per annum. Services were provided by Johanna Pierre Environmental Consulting Ltd.

Review milestones:

- Draft Final report tabled on the CSP webpage on 5 June 2018
- Final report made available on the CSP webpage on 1 October 2018

Citation

Pierre, J. P. 2018. Using electronic monitoring imagery to characterise protected species interactions: A primer and review. Final report prepared for Conservation Services Programme project INT2017:02. Department of Conservation, Wellington. 42 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/int2017-02-final-report-em.pdf

2.5 INT2017-03 Identification of marine mammals, turtles and protected fish captured in New Zealand fisheries

Overall objective

To determine which marine mammal, turtle and protected fish species are captured in fisheries and their mode of capture.

Specific objectives

1. To determine, primarily through examination of photographs, the taxon and, where possible, sex, age-class and provenance of marine mammals, turtles and protected fish captured in New Zealand fisheries (for live captures and dead specimens discarded at sea).

Rationale

The accurate determination of the taxon of marine mammals, turtles and protected fish captured in New Zealand fisheries is vital for examining the potential threat to population viability posed by incidental fisheries captures. Observers on commercial vessels are not always able to identify marine mammals, turtles and protected fish at sea with high precision, and the assessment of the age-class may require expert knowledge. Information gained through this project will link to Ministry for Primary Industry databases and will inform ongoing bycatch estimation, risk assessment, research and modelling of the effects of fisheries bycatch on marine mammals, turtles and protected fish populations.

This is a new project and is designed to complement the existing seabird identification project. Observers routinely collect samples of genetic material from these taxa, and these can be used to resolve uncertain identification determinations from photographs.

Project status

Ongoing.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $15,000 per annum.

3. Population Projects

3.1 POP2015-02 Flesh-footed shearwater: Various locations populations project

Overall objectives

1. To estimate the population size of flesh-footed shearwater at Middle Island (Mercury Islands).
2. To estimate key demographic parameters of flesh-footed shearwater at Lady Alice Island/Mauimua and Ohinau Islands.
3. To describe the at-sea distribution of flesh-footed shearwater breeding at Northland breeding sites.

Rationale

The Conservation Services Programme Seabird medium term research plan 2015 (CSP seabird plan 2015) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2015 for delivery in 2015/16 were identified and prioritised by the CSP RAG. This proposal covers prioritised components involving field work on flesh-footed shearwater, classified as at very high risk from commercial fisheries. Supporting rationale for all the components is summarised in the CSP seabird plan 2015.

Project status

Complete.

Summary of the methods and key findings

Population monitoring

This is the second and final year of intensive monitoring for the entirety of the breeding season for both populations. Preliminary monitoring and banding of the Ohinau Island population was conducted in April/May 2016. In 2017/2018, a total of 228 study burrows were monitored on Ohinau Island and 230 on Lady Alice Island. The breeding success on Ohinau Island was 68% this season, up from 51% in the previous season. Breeding success on Lady Alice remained relatively low at 52% compared to 50% in the previous season. The difference in breeding success between the two islands this season is possibly due to the effect that La Niña had on the different foraging areas exploited by each of the populations. 98% of breeding burrows on Lady Alice Island and 88% of breeding burrows on Ohinau had both partners identified. 81% of birds that bred in 2016/17 bred again this season indicating most birds breed annually.

A total of 1,956 flesh-footed shearwaters have now been banded of both islands during the previous three breeding seasons. A population survey was conducted for Ohinau Island and there are an estimated 4,007 occupied burrows, nearly twice as many as the previous two estimates conducted in the last 10 years. A population survey was also carried out for the LA1 colony on Lady Alice Island and there was an estimated 867 occupied burrows, eight times that which was estimated almost ten years ago.

Foraging distribution and behaviour

This covers the final part of the objective to describe the at-sea distribution of flesh-footed shearwaters breeding at Northland breeding sites carried out under Conservation Services Programme project POP2015-02. A total of 24 flesh-footed shearwaters were fitted with GPS and GLS during incubation stage in January 2018 and this yielded 13 individual tracks. Foraging trips were on average 14.7 days long and an average of 4,395 km was travelled. Tracks varied between individuals and some foraging areas overlapped with those recorded during chick-rearing but overall a largely different foraging range was observed.

Foraging hotspots were on the west coast of the North Island between the Kaipara and Manukau Harbours and south to the Taranaki Bight. Foraging occurred predominantly during daylight with most of the night being spent resting on the water. The difference in foraging distribution between the two breeding stages may be explained by a dual-foraging strategy. Longer foraging trips were perhaps as a result of the La Niña event experienced this season and future tracking may yield a different result.

Recommendations

Further population surveys of other islands inhabited by flesh-footed shearwaters are warranted and monitoring of the populations on Ohinau and Lady Alice islands should continue.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. This is a three-year project and the planned cost for the project was $80,000 per annum. Services were provided by Wildlife Management International Ltd.

Review milestones:

- Project update presentation at the CSP TWG meeting on 10 June 2016
- Final reports for 2015/16 component made available on the CSP webpage in June 2016
- Project update presentation at the CSP TWG meeting on 27 July 2017
- Final reports for 2016/17 component made available on the CSP webpage in February 2017
- Project update presentation at the CSP TWG meeting on the 24 May 2018
- Final reports for 2017/18 component made available on the CSP webpage in October 2018

Citation

Mischler, C.P. 2016. Conservation Services Programme, Flesh-footed Shearwater Project 4653, Demographic Component, April-May 2016 Report. Report prepared by Wildlife Management International Ltd for the New Zealand Department of Conservation, Wellington. 11p.

Crowe, P., Bell, M., Kirk, H. and Burgin, D. 2017. Flesh-footed shearwater population monitoring on Ohinau and Lady Alice Islands, 2016/17 report. Report prepared by Wildlife Management International Limited for the New Zealand Department of Conservation, Wellington. 20p.

Bell, M.D., Boyle, D.P. 2017. Population estimate of Flesh-footed Shearwaters on Middle Island. Report prepared by Wildlife Management International Limited for the New Zealand Department of Conservation, Wellington. 12p.

Kirk, H., Crowe, P. and Bell, M. 2017. Foraging distribution and behaviour of flesh-footed shearwaters (*Puffinus carneipes*) breeding on Lady Alice Island – February 2017. Report prepared by Wildlife Management International Limited for the New Zealand Department of Conservation, Wellington. 24p.

Crowe, P. 2018. Flesh-footed shearwater population monitoring on Ohinau and Lady Alice Islands, 2016/17 report – June 2018. Report prepared by Wildlife Management International Limited for the New Zealand Department of Conservation, Wellington. 23p.

Crowe, P. 2018. Foraging distribution and behaviour of flesh-footed shearwaters (*Puffinus carneipes*) breeding on Lady Alice Island – January 2018. Report prepared by Wildlife Management International Limited for the New Zealand Department of Conservation, Wellington. 21p.

Weblink

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2015-16/flesh-footed-shearwater-demographic-component-2015-16/

http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2016-17/flesh-footed-shearwater-various-locations-population-project-2016-17-update/

https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2017-18/flesh-footed-shearwater-various-locations-population-project-2017-18-update/

3.2 POP2016-05 Yellow-eyed penguin foraging and indirect effects

Overall objectives

1. To describe the at-sea foraging distribution of adult and juvenile yellow-eyed penguins breeding in Otago and Southland.
2. To collate and synthesise existing information relevant to the indirect effect of commercial fishing induced benthic habitat modification on the mainland population of yellow-eyed penguins.
3. To identify mechanisms through which commercial fishing induced benthic habitat modification may affect the mainland population of yellow-eyed penguins, and provide recommendations for future research to better understand these indirect effects.

Rationale

Ellenberg and Mattern (2012; output of CSP project POP2011-08) provided research recommendations to understand the impact of fishing induced benthic habitat modification on yellow-eyed penguins in the Otago and Foveaux Strait regions. The recommendations include data collection on yellow-eyed penguins using GPS devices, and sea floor surveys.

This project aims to build on a proposed research programme at Otago University to investigate the diet, dispersal, and foraging strategies of yellow-eyed penguins. Such information will form a key component of further investigation of mechanisms of potential indirect effects of commercial fishing on this species. This project will also assess available information to describe mechanisms for potential indirect effects of commercial fishing and provide recommendations to better understand mechanisms identified. A thorough collation and synthesis of existing information will ensure cost effectiveness and synergies with other research programmes are maximised in progressing our understanding in this area.

Project status

Complete.

Summary of the methods and key findings: Biological component

Even though the mainland population of Yellow-eyed penguins represents the most studied group of penguins in New Zealand, information about their prey composition is scarce. The bulk of the work to date - and collated in this report - has been conducted in the mid-1980s and early 1990s with more recent dietary information being very limited. However, data at hand suggest that a significant shift in the major prey species has occurred in the past 30 years where red cod, a dominant prey species in terms of frequency of occurrence and diet biomass at many sites in the 1980s, has been largely replaced by blue cod since the 1990s. There is a considerable difference in size between red cod, that were predominantly caught during the larval and early juvenile stage (length: 50-80mm), and blue cod, which was consumed at significantly larger sizes (160-220 mm). This may affect the survival of penguin chicks which appear not be able to ingest such large prey. The shift from red cod to blue cod coincided with a substantial reduction in landings in the red cod fishery, with some indications that fishing pressure may have contributed to a depression of red cod stocks. It appears that fisheries-related disturbance of the Yellow-eyed penguins' benthic foraging habitat may have favoured blue cod, due to this species' relative tolerance to fishing disturbance leading to an apparent increased

availability in fished areas. There are regional differences in Yellow-eyed penguin diet composition. In regions where seafloor habitats are defined by coarse sand and gravel penguin diet is dominated by opalfish, while in regions with structured benthos (e.g. biogenic reefs, horse mussel fields) but also seafloors exposed to bottom fisheries, blue cod is a more prevalent prey species in their diets. There are clear indications that Yellow-eyed penguins from the New Zealand mainland are impacted by indirect effects of anthropogenic activities at sea, predominantly fisheries operations. However, the current knowledge of the Yellow-eyed penguins' diet composition and marine ecology in general is limited, which makes it difficult to assess the extent to which these effects contribute to the mainland population's current decline.

Summary of the methods and key findings: Geospatial component

Geospatial data (focusing on the east coast of the South Island) was gathered from multiple sources and presented at a workshop. This included a presentation of hoiho tracking data, AIS data, VMS data, fishing restrictions, river discharge points, bathymetric data, benthic composition, fishing effort data and commercial catch data. Data layers were overlaid and discussed by participants of the workshop.

Recommendations

- Use GPS dive trackers at representative sites on an annual basis to detect any changes in foraging ranges in relation to anthropogenic activities.
- Establish a non-invasive diet monitoring programme.
- Regular collection of feathers and blood samples for current and future stable isotope analyses.
- Conduct a comprehensive baseline study of Yellow-eyed penguin foraging ecology on the sub-Antarctic Islands.
- Include Moeraki and South Catlins in juvenile tracking sampling.
- Extend spatial and temporal tracking of 2nd year juveniles to identify interactions with commercial fisheries.
- Gather further information on ecological parameters of both commercially valuable and non-commercially valuable fish species of specific value to hoiho.
- Investigate options to engage with fishers to develop options for gear switching in bottom fishing fisheries and reducing spatial and temporal overlaps to reduce potential indirect and direct effects
- Investigate options to determine whether there has been an increase in predation rates as a result of indirect effects of fishing of sharks and barracoutta.
- Continue to undertake habitat mapping with the particular objective to understand permanent bottom modification of commercial fisheries using multi-beam survey and cameras on hoiho.
- Engage with fishers to gather information on different habitat types found along the coast of the South East and Southern South Island.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $25,000 per annum. Services were provided by Eudyptes EcoConsulting (biological component), Marico Marine NZ (geospatial component) and Jody Weir (workshop report). In reviewing the outputs of the project, it was deemed that due to paucity of key ecological data

quantitatively assessing the extent of indirect effects was not possible here, therefore the levied component of the funding will be returned to industry.

Review milestones:

- Draft results presented at the CSP TWG meeting on 2 May 2018
- Final reports made available on the CSP webpage in August 2018

Citation

Mattern, T. and Ellenberg, U. 2018. Yellow-eyed penguin diet and indirect effects on prey composition: collation of biological information (CSP16205-1, POP2016-05). Report prepared by Eudyptes EcoConsulting for the New Zealand Department of Conservation. Wellington, New Zealand. 39 p.

Weir, J. 2018. Hoiho (Yellow-eyed penguin) foraging and indirect effects: Expert workshop report. Conservation Services Programme. Department of Conservation. Wellington, New Zealand. 12 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop-2016-05-indirect-effects-on-yellow-eyed-penguin.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2016-05-yellow-eyed-penguin-indirect-fisheries-effects-workshop-report.pdf

3.3 POP2017-01 Seabird population research: Chatham Islands 2017-18

Overall objectives

To collect information on key aspects of the biology of selected at-risk seabird species in order to reduce uncertainty or bias in estimates of risk from commercial fishing.

Rationale

The Conservation Services Programme Seabird medium term research plan 2016 (CSP seabird plan 2016) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds Objectives. It was developed as part of the work of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2016 for delivery in 2016/17 were identified and prioritised by the CSP RAG. This project covers prioritised components involving field work at the Auckland Islands, which have been developed to maximise cost and logistical efficiencies between components. Supporting rationale for all the components is summarised in the CSP seabird plan 2016.

In the 2017/18 year, the ground team is to return to the Sisters to complete counts for the Northern Buller's, and Northern royal albatrosses. This trip will fill the gaps left by the 2016/17 work which was unable to reach the island due to weather. Additionally. A re-survey of Northern Royal albatross will be particularly important to reduce uncertainty for this biennial breeder.

Project objectives

1. To carry out a census of breeding pairs of Northern Buller's and Northern Royal albatrosses on The Sisters Islands during the early-mid incubation period.

Project status

Complete.

Summary of the methods and key findings

A full census of Northern Buller's Mollymawk across both islands recorded 3,273 nests, of which 3,158 showed evidence of breeding this season (753 nests on Te Awanui/ Middle Sister and 2,520 on Rangitautahi/ Big Sister). In 2016 a total of 16,764 breeding pairs were recorded on Motuhara, giving a total breeding population for the Chatham Islands of 20,000 pairs; slightly higher than previously published estimates for the species.

A census of Northern Royal Albatross recorded 2,388 nest sites, including 2,255 nests which showed evidence of breeding this season (864 on Te Awanui/ Middle Sister and 1,391 on Rangitautahi/ Big Sister).

Combining the results of last year's research and additional aerial counts (2016-2017) it is possible to investigate the population trends. Determining the total population and population trend of Royal Albatross is problematic due to the biennial breeding behaviour. However, both the annual number of breeding pairs and the total breeding population indicate that the population is in decline, and that this decline is most significant on Motuhara. The causes for the decline are unknown but may be

related to 15 years of low productivity on Motuhara following the 1984 storm which stripped the island of vegetation and soil.

A complete count of both islands recorded 47 Northern Giant Petrel chicks on Little Sister and 20 chicks on Rangitautahi/ Big Sister. Applying a correction factor, using breeding success calculated from Rangitautahi/ Big Sister, the breeding population on Rangitatahi is estimated to be 156 breeding pairs (110 pairs on Te Awanui/ Middle Sister and 46 breeding on Rangitautahi/ Big Sister). In 2016 a total of 1,977 breeding pairs was estimated on Motuhara, giving a total breeding population for the Chatham Islands of 2,150 pairs; similar to previously published estimates for the species.

Recommendations

- Continue a programme of population monitoring using aerial surveys and ground counts as appropriate.
- Start a demographic study on Northern Royals, especially on Motuhara.
- Start chick cohort banding.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $25,000. Services were provided by Wildlife Management International Limited.

Review milestones:

- Results were presented on at the CSP TWG meeting on 24 May 2018
- Final report made available on the CSP webpage 10 January 2019

Citation

Bell, M.D., Bell, D.J., Boyle, D.P. and Tuanui-Chisholm, H. 2018. Rangitatahi Seabird research: December 2017. Technical report to the Department of Conservation. Wellington, New Zealand. 27 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2017-01-rangitatahi-seabird-research-2017.pdf

3.4 POP2017-02 Indirect effects of fishing on New Zealand sea lions

Overall objective

To better understand the indirect effect of commercial fishing on New Zealand sea lions at the Auckland Islands through changes in prey availability.

Specific Objectives

1. Analyse and process a range of opportunistic and historic diet samples.
2. Characterise the effect of diet on sea lion demographics at the Auckland Islands since 1997.
3. Compare changes in prey availability and commercial fishing catch rate across a similar period.

Rationale

Female New Zealand sea lion nutritional stress has been identified as a potential driver of population decline through a range of mechanisms, e.g. reduced pup production, smaller pups, and reduced female survivorship. Nutritional stress, in turn, may be caused by the absence of prey species with high nutritional value, such as can be caused by the removal of sea lion prey species (e.g. hoki and squid), an indirect effect of commercial fishing.

It was acknowledged during the development of the New Zealand sea lion Threat Management Plan that analysis of historic faecal, scat, and blubber samples would improve our understanding of female nutritional stress and the impacts on the population. It is proposed that any new opportunistic samples and historic samples are analysed and made available for further demographic modelling and bioenergetic assessment.

Diets of New Zealand sea lion have been investigated using stomach contents and regurgitates, as well as from fatty acid composition and stable isotope analysis. While the former methods have provided data for many years, they remain snapshots of diets that may be biased by differential digestion and egestion rates of particular tissues (e.g., hard parts such as beaks and otoliths). The fatty acid composition of predators has the potential to reflect diets over longer periods, and to be unbiased by digestion and egestion rates. However, some fatty acids will be preferentially assimilated and metabolized (converted) by the predator, so predators' fatty acid composition rarely reflects diet fatty acids directly. This process of assimilation and modification needs to be accounted for. This can be achieved by using a set of conversion coefficients estimated from previous captive feeding trials. Bayesian modelling can be applied to the range of methods used for collection of data on diet to compare with demographic rates. This project will focus largely, but not exclusively, on the data rich period of 2000-2006.

Project status

Ongoing.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $80,000.

3.7 POP2017-03 Salvin's albatross Bounty Islands population project

Specific objectives

1. To estimate the population size of Salvin's albatross at the Bounty Islands.
2. To describe the at-sea distribution of Salvin's albatross breeding at the Bounty Islands.

Rationale

The Conservation Services Programme Seabird medium term research plan 2017 (CSP seabird plan 2017) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds[6] Objectives. It was developed at the request of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2017 for delivery in 2017/18 were identified and prioritised by the CSP RAG.

This project covers prioritised components involving field work for Salvin's albatross at the Bounty Islands. Recent population estimates of Salvin's albatross at the Bounty Islands (part of CSP project POP2012-06) using ground and aerial methods found contrasting evidence in regards population trend. The at-sea foraging distribution of this population is described from only a small sample size of individuals due to device failure in a recent study (also part of POP2012-06).

Project status

Postponed to 2018/19 due to logistic constraints.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $120,000.

[6] National Plan of Action – 2013 to reduce the incidental catch of seabirds in New Zealand Fisheries. Available for download at: http://deepwatergroup.org/wp-content/uploads/2015/11/GEN2015A4-5770922-2013-National-Plan-of-Action-Seabirds-including-cover-11.pdf

3.8 POP2017-04 Seabird population research: Auckland Islands 2017-18

Overall objective

To collect information on key aspects of the biology of selected at-risk seabird species in order to reduce uncertainty or bias in estimates of risk from commercial fishing.

Specific objective

1. Adult survival, other demographic parameters and estimate population size of Gibson's albatross on Adams Island
2. Adult survival, other demographic parameters and estimate population size of White-capped albatross on Disappointment Island

Rationale

The Conservation Services Programme Seabird medium term research plan 2017 (CSP seabird plan 2017) outlines a five-year research programme to deliver on the seabird population research component of CSP. It is targeted at addressing relevant CSP Objectives (as described in the CSP Strategic Statement) and National Plan of Action – Seabirds[7] Objectives. It was developed at the request of the CSP Research Advisory Group. Key components of research described in the CSP seabird plan 2017 for delivery in 2017/18 were identified and prioritised by the CSP RAG. This proposal covers prioritised components involving field work at the Auckland Islands, which have been developed to maximise cost and logistical efficiencies between components. Supporting rationale for all the components is summarised in the CSP seabird plan 2017.

Project status

Complete.

Summary of the methods and key findings

Gibson's albatross

Estimates of population size, survivorship, productivity and recruitment were made from a mark-recapture study undertaken in a 61 ha intensively monitored study area. The size and trend of the Gibson's albatross population was estimated by counts of active nests in 3 representative parts of their main breeding grounds on Adams Island which have been re-counted repeatedly since 1998.

Productivity in 2017 was 68%, the same as it had been in 2016, and back at a level not seen since the population crashed in 2005. The number of birds nesting in 2018 continued the slow post-crash increase. There were estimated to be 4,829 pairs of Gibson's albatross breeding in 2018, a bit more than half the number of pairs breeding in 2004 (ie 8,728) before the population crashed. Nesting success and the number of females choosing to breed each year appears related to the large-scale patterns of climate variability, particularly the southern oscillation.

[7] National Plan of Action – 2013 to reduce the incidental catch of seabirds in New Zealand Fisheries. Available for download at: http://www.mpi.govt.nz/

The demography of Gibson's wandering albatross continues to improve following the "crash" in 2006. Nesting success has been at or above pre-crash levels for the last two years, the number of breeding females in the population is roughly stable and the number of females choosing to breed is now roughly equal to the number not breeding, as it was before the crash (Figure 7). The net effect is that the number of birds nesting on the island continues to increase. However, annual mortality is a little higher than it used to be, the population is still substantially smaller than it was in 2005, and because of this the number of chicks being produced is much lower than it used to be. Wandering albatrosses start breeding at about 12 years old and most birds joining the breeding population now, were produced during a time when chick production was very low. This means there are now limited numbers of pre-breeders which, along with an adult mortality rate which remains elevated, suggests recovery of the population is likely to be slow.

White-capped albatross

To estimate key parameters, including adult survival, recruitment and population trends, we established a marked population of breeding birds at Disappointment Island, Auckland Islands (the largest population of white-capped albatross). We report on field work in early 2018 to resight banded albatrosses and increase the number of banded birds in the study area. A total of 521 breeding white-capped albatrosses have been banded in four annual visits to Disappointment Island 2015–2018. A third of white-capped albatross banded in previous years were re-sighted in 2018, compared to 22% and 23% in the two previous visits 2016 and 2017. These resighting rates are encouraging, given the short duration of visits (insufficient time for incubating birds to be relieved by mates), and given that the primary focus of the work was on banding, not resighting.

Three years of recaptures are not sufficient for robust demographic rate estimates, but enable some exploratory analyses. To assess how many further resighting visits might be required for demographic rate estimates to be suitably precise, we generate preliminary demographic rates from re-sightings to date (2015–2018) and use these to simulate realistic 'dummy' resighting data that build on the real data to date. Simulation modelling indicated that the accuracy and precision of all estimated parameters incrementally improves with further consecutive resighting years. Using the example of adult survival, we show that the rate of decrease in the variance of survival estimates was greatest with 1–3 further years of consecutive resighting effort from present.

Recommendations

Gibson's albatross

While the conservation status of Gibson's wandering albatross is poor, monitoring the size of the population and its structure and trend on Adams Island remains a priority.

White-capped albatross

- Study focus: Further visits can now primarily focus on resighting banded birds, with banding further new individuals a secondary aim.
- Study timing and duration: To maximise resighting rates and minimise breeding failures, we recommend timing visits to the brood-guard period in early February. A minimum of five days on the island are needed for suitable boat conditions and weather contingency.
- Data exploration: Simulation modelling suggested another 3-6 years of resighting data to obtain robust, precise demographic rate estimates suitable for risk assessments and conservation status. Further modelling should allow for time-varying demographic rates.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $90,000. Services were provided by Albatross Research (Gibson's albatross component) and Parker Conservation (White-capped albatross component).

Review milestones:

- Results presented at the CSP TWG meeting on 24 May 2018
- Final reports published on the CSP website in December 2018

Citation

Rexer-Huber, K., Thompson, D.R. and Parker, G.C. 2018. White-capped albatross mark-recapture study at Disappointment Island, Auckland Islands. Report to the Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin. 15 p.

Elliott, G., Walker, K., Parker, G. and Rexer-Huber, K. 2018. Gibson's wandering albatross population study and census 2017/18. Report prepared for the Department of Conservation, Wellington. 16 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/draft-pop2017-04-white-capped-albatross-mark-recapture.pdf

https://www.doc.govt.nz/contentassets/f2d679dc8fa5486e9edee23f8a60fcf7/pop2017-04-gibsons-final-report.pdf

3.9 POP2017-05 New Zealand Sea Lion: Auckland Islands pup count

Specific objectives

1. To estimate New Zealand sea lion pup production at Enderby, Figure of eight and Dundas Islands.
2. To update the New Zealand sea lion database

Rationale

New Zealand sea lions are classified as Nationally Critical (Baker et al. 2010), and are incidentally killed each year in southern commercial trawl fishing operations targeting species including squid, scampi and southern blue whiting. The foraging areas of New Zealand sea lions at the Auckland Islands have been shown to overlap with commercial trawl fishing activity, particularly SQU6T and SCI6A. Approximately 7o% of New Zealand sea lions breed at the Auckland Islands, where population data have been collected since the mid-1990s, including estimates of pup production and resighting of marked animals. Since 2001 there has been a considerable decline in pup production at the Auckland Islands. A literature review to identify potential indirect effects of commercial fishing on the Auckland Islands population as part of CSP project POP2010-01 (Bowen 2012) highlighted a number of key information gaps that currently prevent a full understanding of any such potential indirect effects, including time series data of population dynamics as collected in this project. CSP project POP2012-02 analysed population data collected during previous years in order to determine the key demographic factors driving the observed population decline of New Zealand sea lions at the Auckland Islands. It found that low pupping rates, a declining trend in cohort survival to age 2 and low adult survival may explain declining pup counts in one studied population (Roberts et al. 2014).

In response to the continued decline at the Auckland Islands, the Ministers of Conservation and Primary Industries announced that a Threat Management Plan (TMP) for New Zealand sea lions would be developed. This is currently underway and full public consultation occurred in the second quarter of 2016. This research project is scoped to collect pup count information required to manage the impact of commercial fishing on the Auckland Islands population, in line with CSP Objective E. It is envisaged that other research, and/or management actions, will be progressed as part of the TMP, and may be delivered alongside the research programme proposed here to provide logistical synergies.

Project status

Complete.

Summary of the methods and key findings

1. Pup production was estimated for NZSL colonies at Sandy Bay (n=332), Dundas Island (n=1,397), Figure of Eight Island (n=63) and South East Point (n=0); with total pup production for the Auckland Islands in 2017/18 estimated as 1,792. The estimate in 2017/18 is 9% lower than for 2016/17 but is 19% higher than the lowest ever estimate for pup production in 2008/09. Since the lowest ever estimate in 2008/09, there has been an approximate mean 1.0% annual increase in overall pup production at the Auckland Islands. While this is positive news, it is important to note that pup production in 2017/18 still represents a 41% decline since the peak in 1997/98.

2. Estimates of pup mortality to the date of the pup production estimate in mid-January are broadly comparable to previous 'non-epidemic' years. However, many of these figures do not represent full season surveys and are not directly comparable to data collected prior to 2012/13, and so should be viewed as a minimum. Pup mortality estimates to the date of the pup count are: Sandy Bay 7% (to 16 January), Dundas Island 4% (on 19 January), Figure of Eight Island 13% (on 1 February) and was 5% overall for all sites, noting the difference in estimation methods.
3. Three of the four mean pup weights in 2017/18 were lower than those in 2016/17. At Sandy Bay, weights were 1% and 10% lower than for females and males respectively. Mean pup weights at Dundas Island were 4% lower and 5% higher for females and males respectively.
4. Seven hundred and sixty three pups were marked at the Auckland Islands including: Sandy Bay – 309 flipper tagged and microchipped; Dundas Island – 400 flipper tagged only, and Figure of Eight Island – 54 flipper tagged only.
5. Provisional cause of death was not part of this contract and will be reported separately by DOC;
6. There was only a small amount of resighting effort conducted as part of this project as there was no time allocated to it. Additional limited resighting effort was undertaken by DOC personnel remaining on Enderby Island prior to and after this work;
7. To the end of the field season on 22 January, there were few reports of pup mortalities in holes due to the fact that pups at Sandy Bay had yet to reach the areas with holes by that time. Preliminary reports from the full season suggest that no pups died in holes at Sandy Bay during the season and that two new ramps were added in areas where pups had not been seen previously (S. Michael pers. comm.). Additional ramps were also added to key spots on Dundas Island last year, which has likely contributed to the lower observed rate of mortality in holes at Dundas Island this year.

Project logistics summary statement

This project was 90% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $100,000. Services were provided by Blue Planet Marine.

Review milestones:

- Final results presented at the CSP TWG meeting on 2 May 2018
- Final report published on the CSP website in June 2018

Citation

Childerhouse, S., Burns, T., Michael, S., Godoy, D., McNutt, L. and McCormack, C. 2018. Final Report for CSP Project New Zealand sea lion monitoring at the Auckland Islands 2017/18. Report for the Department of Conservation, Wellington, New Zealand. File name: BPM-18-DOC-Final Report for CSP Project NZSL Auckland Island monitoring 2017-18 v1.3. Date 18th June 2018. 19 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/marine-mammals/nz-sea-lion-tmp/bpm-final-preliminary-report-nzsl-auckland-island-monitoring-2017-18.pdf

4.0. POP2017-06 Indirect effects on seabirds in north-east North Island region

Overall objective

To better understand the indirect effect of commercial fishing on seabirds in north-east North Island through changes in food availability through fish work-ups

Specific objectives

1. Identify the range of potential seabird prey species within fish work-ups
2. Identify food fed to chicks of key surface feeding seabirds.
3. Compare prey availability in fish work-ups with the diet of the target seabird species.
4. Collect baseline population data on surface nesting seabirds on a sample of northern offshore islands to monitor long-term changes in populations

Rationale

A range of commercial fisheries target aggregations of surface shoaling fish. Purse seining is commonly used to capture these fish schools. The dense fish schools create a phenomenon known as fish work-ups. These fish drive up prey items to the sea surface and observations suggest that this forms an important food source for a range of seabird species. There is currently poor knowledge of both the diet of surface-foraging seabirds and what prey items are being made available to seabirds from fish work-ups. This is currently limiting our understanding of the mechanisms through which changes in the distribution and/or abundance of fish work-ups may be driving seabird population changes (population status and annual breeding success). Recent population abundance data are also incomplete or unknown for many seabird species that interact with surface feeding fish shoals and limits our assessment of population trends over time.

Field research will be focussed on key northern offshore island sites such as the Mokohinau Islands, Hen and Chicken Islands, Poor Knights, and Three Kings, where species such as red-billed gull, white-fronted tern, Australasian gannet, fairy prion, Buller's shearwater and fluttering shearwaters breed. Research is needed to further our understanding of the diet, foraging ecology, breeding success and population status of these species that regularly forage in association with fish work-ups. Sampling prey availability within fish work-ups and in the same water surface zones under normal conditions (without fish shoals present) would provide further information on the range of potential prey species made available to seabirds by fish work-ups.

Project status

This is a three-year term project that is due for completion in June 2019. The final draft reports for the 2017/18 year are now complete.

Summary of the methods and key findings

Objective 1: Plankton sampling, in combination with topside photography and underwater videography has enabled identification and categorisation of fish school and corresponding seabird behaviour, as well as the composition of the mesozooplankton community. The sampling is to continue through the 2018-2019 season now that techniques have been developed and firm protocols are in place for collecting. Samples collected in the first season (2017-2018) have been sorted and identified, with a draft analysis prepared. Clear seasonal trends can be seen across all of the samples.

For example, Malacostraca were present in 97% of samples and were generally more abundant during summer months. Malacostraca were counted into seperate groups: Euphausiid adults, stomatopod larvae, isopods, amphipods, brachyura (crab) larvae and crayfish phyllosoma with the rest grouped into a “decapod shrimp” category which included potential juvenile eupahusiids.

Objective 2: Methods for collecting faecal and regurgitation samples from seabirds trialled in the first season, together with additional methods acquired through consultation are now being applied to the current season with collection from four of the study species (Buller's shearwater, fairy prion, fluttering shearwater and red-billed gull) well underway. The other two species are to follow: Australasian gannet in December 2018 / January 2019, and white-fronted terns, once accessible colonies have been found as they have proved elusive to date despite being seen in significant numbers in parts of the Hauraki Gulf.

Objective 3: Comparison of food availability from fish shoals with what food is fed to the target seabird species will be undertaken once all the sampling is complete and data entered and analysed.

Objective 4: Buller's shearwater surveys to establish a base-line population estimate had been completed prior to the contract start and analysis, taking account of habitat and topography, has been completed with the write-up in preparation (Friesen et al. in prep). The initial estimate indicates a population significantly lower than previously estimates. This was the first comprehensive survey undertaken for this species across all breeding stages, and first for Tawhiti Rahi (Poor Knights Islands). An aerial survey of Australasian gannet colonies in northern New Zealand to establish trends in populations was conducted in November 2017. A very large colony of fairy prions were discovered on Tawhiti Rahi adding to known smaller colonies on the same island and Aorangi. The Poor Knights is the only known colony of fairy prions in northern New Zealand. Confirmation of major populations of fluttering shearwaters on Taranga (Hen) and Marotere (Chicken) Islands, whereas the large numbers reported from the 1980s for Tawhiti Rahi (Poor Knights Islands) do not appear to be present with only small numbers of this species heard during counts.

Recommendations

GPS tracking of Buller’s shearwaters, fairy prions and Australasian gannets, extension to Indirect Effects contract.

An additional season (2019-2010) of plankton sampling (as per POP2017-06) following now-established protocols

Collection of blood & feather samples from flesh-footed shearwaters to investigate ecophysiology, nutrition and foraging ecology variables; help provide a more informative understanding of seabird health. Corticosterone stress hormones (indicative of nutritional stress) can be detected either in plasma and/or feathers of both adults and chicks. Matching this with data on stable isotope and plasma nutrient profiles can provide a fuller insight into inter-colony dietary differences and foraging quality. Also collect regurge and faecal samples as per POP2017-06.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $40,000 per annum. Services were provided by Northern NZ Seabird Trust.

Review milestones:

- Milestone 1 methodology report published on the CSP website 30 November 2017
- Milestones 2&3 interim results presented at the CSP TWG meeting on 24 May 2018
- Milestone 4 interim report published on the CSP website 30 November 2018

Citation

Gaskin, C., Jeffs, A., Dunphy, B., Carroll, E., Adams, N., Friesen, M. and Frost, P. 2017. Indirect effects on seabirds in northern North Island: Methodology report for project. Report to the Conservation Services Programme, Department of Conservation. Northern NZ seabird Trust. 26 p.

Gaskin, C. 2018. Indirect effects on seabirds in northern North Island: Summary of activities carried out to collect samples from fish shoals 2017-18. Report to the Conservation Services Programme, Department of Conservation. Northern NZ Seabird Trust. 25 p.

Gaskin, C. and Adams, N. 2018. Indirect effects on seabirds in northern North Island: Summary of activities carried out to collect samples from seabirds 2017-18. Report to the Conservation Services Programme, Department of Conservation. Northern NZ seabird Trust. 15 p.

Gaskin, C., Frost, P. and Friesen, M. 2018. Indirect effects on seabirds in northern North Island: Summary of activities carried out to collect population estimates of priority seabirds in 2017-18. Report to the Conservation Services Programme, Department of Conservation. Northern NZ seabird Trust. 15 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2017-06-indirect-effects-on-northern-seabirds-milestone-1.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/meetings/pop2017-06-summary-of-activities-fish-sampling-milestone2-draft-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2017-06-summary-of-activities-seabird-sampling-milestone3-draft-report.pdf

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/pop2017-06-indirect-effects-on-northern-seabirds-milestone-4.pdf

4.1. POP2017-07 The age and growth of New Zealand protected corals at high risk

Project objective

Develop a methodology to determine the age and growth characteristics of key high risk New Zealand cold-water coral species.

Rationale

Clark et al (2014; part of CSP project POP2103-05) predicted the distribution of deep sea corals in relation to areas where they are at risk of interactions with commercial trawl gear targeting orange roughy and oreo species on the Chatham Rise. One component of this work was the development of a pilot ecological risk assessment (ERA) for protected corals in New Zealand. Risk assessments such as these are key tools for informing management approaches in that they provide a better understanding of the various aspects and characteristics of coral species and the fishery that contribute to risk determination.

The key limitation of this pilot ERA was data paucity on coral productivity. This relates directly to the "recoverability" of corals from disturbance, which is a key factor in further developing an ERA for protected corals in New Zealand waters. There is currently a paucity of information surrounding deep sea coral regeneration times following trawl disturbances or other damage. A key priority in filling this information gap is research that will allow estimation of the age and growth characteristics of key New Zealand cold-water coral species such as the black corals (*Bathypathes* spp) as well as select gorgonian groups highlighted by the pilot ERA as high risk, such as the primnoid seafans and the genus Paragorgia.

Project status

This project is due for completion in February 2019. The draft final report for the 2017/18 year is now complete.

Project logistics summary statement

This project was 50% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $25,000 per annum. Services were provided by NIWA.

Review milestones:

- Methodology presented at the CSP TWG meeting on 28 March 2018
- Draft final report made available on the CSP website on 3 December 2018

Citation

Tracey, D., Bostock, H. and Shaffer, M. 2018. Ageing methods for protected deep-sea corals: A review and recommendation for an ageing study. Report prepared by NIWA for the New Zealand Department of Conservation, Wellington. NIWA Client Report No. 2018035WN. 35 p.

Marriot, P., Tracey, D., Bostock, H., Hitt, N. and Fallon, S. 2018. Ageing deep-sea corals: Black coral *Bathypathes patula*. Draft interim report prepared by NIWA for the Conservation Services Programme, Department of Conservation, Wellington. 20 p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/methodology-report-age-and-growth-of-coral.pdf

https://www.doc.govt.nz/contentassets/28f0780f0ef845aba7d2883849594d26/pop2017-07-ageing-deep-sea-corals-draft.pdf

4. Mitigation Projects

4.2 MIT2015-02 Small vessel seabird mitigation project

Specific objectives

1. To test the efficacy of mitigation strategies or devices identified by the work of the seabird liaison officers operating in the small vessel bottom longline fleets.
2. To support efficacy testing of the improved tori line designs produced as an output of project MIT2014-02.

Rationale

The small vessel surface longline fishery poses substantial risk to most, high and very high-risk seabirds (see Table 7 of the CSP seabird plan 2015) despite current mitigation requirements and use. Implementation of proven mitigation strategies is known to be variable both within and between these fleets. Seabird Liaison officers have been deployed in the northern inshore bottom longline fleets for the past two years, also moving into the surface longline fleet during 2014/15, and further work is proposed in project MIT2015-01.

In order to provide robust advice on best practice to fishers it is important that new or adapted mitigation options are backed up with adequate testing of efficacy. Recent work has included testing of new weighting options, setting practices and novel devices such as the hook pod (including CSP projects MIT 2011-03, MIT 2012-01 and MIT2013-02). Research is underway to develop improved tori line designs (CSP project MIT2014-02).

Project status

Ongoing.

Summary of the methods and key findings – Mitigating seabird captures during hauling on smaller longline vessels

Seabird captures in longline fisheries may occur on the set, soak or haul. Bycatch reduction measures are best developed, tested and implemented for reducing seabird captures occurring during longline sets. Measures affecting the nature and extent of haul captures, and mitigation approaches to reduce those captures, are not well-known. Further, the difficulty of accurately identifying captures as occurring on the haul means that live seabird captures are typically used as a proxy for haul captures in bycatch datasets.

A global review shows four broad categories of mitigation used during longline hauling: physical barriers, measures that reduce the attractiveness of the haul area, deterrents, and operational approaches that are part of fishing. Of devices that operate as physical barriers to seabirds, bird exclusion devices, tori lines and towed buoys have been tested and proven effective in reducing seabird interactions with hauled longline gear. Discharging fish waste such that seabirds are not attracted to the hauling bay is another effective measure, and seabird abundance around vessels is reduced by retaining fish waste during hauling. While a number of deterrents and ad hoc or reactive approaches to reducing haul captures have been discussed in the literature (e.g. water sprays), these have generally not been empirically tested.

Information collected by government fisheries observers on 73 bottom longline and 60 surface longline trips that have occurred since 1 October 2012 on New Zealand vessels < 34 m in overall length showed that most of these measures are in place here. However, implementation may be limited to a small number of vessels (e.g. one bottom longliner used a tori line and two surface longliners used a buoy to reduce seabird interactions with gear at hauling). Implementation may also not be consistent amongst vessels in a fleet, or on the same vessel between trips (e.g., for fish waste management, where some skippers retained all waste until after hauling or discharged when hooks were well below the sea surface, whilst others discharged used baits directly back into the hauling bay as the line was pulled in). This variation in practices creates consequent variation in haul capture risks. Further, the information already available on vessel operations in New Zealand is sufficient to enable actions to reduce haul capture risks.

Fisher and observer records returned from smaller-vessel New Zealand longline fisheries since 1 October 2009 show that 19 - 32% and 12 – 15% of seabird captures were live, and so likely to have occurred on the haul, for bottom and surface longline respectively. Reports of live-captured petrels and shearwaters captures were more common than albatross captures in datasets for bottom longline fisheries overall. However, these data are numerically dominated by captures reported from Fisheries Management Area (FMA) 1 (where no albatross captures were documented).

Recommendations

Recommended next steps to progress haul mitigation work in smaller-vessel bottom longline fisheries includes prioritising mitigation efforts in FMA 1, given the relatively large numbers of captures of high-risk seabirds reported there. For surface longline fisheries, a fleet-level approach is recommended, given vessels are often mobile amongst FMAs due to the highly migratory nature of target fish species and relatively smaller number of vessels involved (less than 40). Mitigation efforts should include exploring device deployments (e.g. buoys) to reduce haul captures and improving the quality and consistency of fish waste management practices that minimise capture risks during hauling. Recommendations are also provided for enhancing data collection to improve knowledge and understanding of the nature and extent of haul captures in New Zealand's smaller-vessel longline fisheries.

Summary of the methods and key findings – 'Barrier' and 'dangler' haul mitigation designs for bottom longline vessels

A trip to sea on a vessel targeting bluenose with bottom longlines was used to test 'barrier' and 'dangler' approaches to reducing interactions and seabird abundance at the hauling station. Following initial setup and refinement a 'dangler' was chosen for quantitative testing over seven days' fishing. The dangler comprised of a single solid dropper with a 150mm diameter float on the water surface 1.8 m from the side of the vessel and 2 m astern of the hauling station.

Trials involved switching between no mitigation and a 'dangler' treatment within hauls. Real-time data included bird abundance within 100m of the vessel, within two metres of the longline and within two to five metres of the longline. Counts were also made on the number of birds entering the areas close to the longline in 5-minute observation periods. Analysis of video footage collected at the hauling station provided counts of birds within 2 m of the hauling station during consecutive 10 second periods throughout hauling. No seabird bycatch (alive or dead) was observed during the trip.

Whilst abundance within 100m of the vessel was similar between treatments the dangler device reduced bird abundance in the danger area around the longline, compared to the no mitigation treatment.

Video footage and real time counts showed similar responses. The continuous coverage afforded by reviewing video footage provided a more comlete picture over time, however real-time data allowed for a better assessment of the 'danger area' relative to the longline, and provided a more complete summary of fishng operations.

The dangler fitted into the fishing operation with little or no disruption to normal fishing practices, and the skipper and crew were willing to continue using it. Fishers are most likely to incorporate specific hauling mitigation devices if they fit around their current fishing operation, and are easy to deploy and recover.

A large number of variables influenced interactions between birds and fishing gear during the haul. Combined with a single trip, in a single area, and without aggressively foraging birds these variables limit the certainty around these results. Similarly, with a small data set it was not deemed appropriate to attempt to quantify efficacy of the device.

Recommendations

-Haul mitigation devices should be considered in conjunction with how the discarding of used bait, offal and fish can be best managed to minimise risk to birds.

-Further investigate the efficacy of a dangler – type approach, in conjunction with managing the discarding of loose baits, offal and fish, in a wider range of conditions and fisheries.

-Encourage wider uptake of specific hauling mitigation devices, supply similar setups to other vessels, and gather feedback from skippers.

-Consider using camera footage collected under the Trident monitoring project to investigate the circumstances around live captures, and the possibility of trialling hauling mitigation devices on vessels fitted with cameras to investigate efficacy.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The projects delivered in 2017/18 were part of the planned costs for the project of $100,000 in 2016/17. Services were provided by Vita Maris and JPEC Ltd.

Review milestones:

- Presentations of draft results to the CSP TWG on 28 Feb 2018.
- Draft final reports circulated to CSP TWG on 28 Feb 9 April 2018.
- Final reports made available on the CSP webpage in October 2018.

Citation

Goad, D. 2018. Small longline vessel hauling mitigation development. Report prepared for the Conservation Services Programme, Department of Conservation, Wellington. 15 p.

Pierre, J.P. 2018. Mitigating seabird captures during hauling on smaller longline vessels. Report to the Conservation Services Programme, Department of Conservation. JPEC Ltd. 47 p.

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https://www.doc.govt.nz/contentassets/fc47f004da244f9db5c43f9c615e0542/mit2015-02-final-report-haul-mitigation-review.pdf

https://www.doc.govt.nz/contentassets/fc47f004da244f9db5c43f9c615e0542/mit-2015-02-hauling-mitigation-report-final.pdf

4.3 MIT2016-01 Protected species bycatch media

Project Objectives

1. To produce a newsletter to communicate protected species-related information to commercial fishermen;
2. To produce media suitable for incorporation into third party publications in order to maximise audience exposure.
3. To develop and produce identification tools targeted at commercial fishermen to improve their understanding of protected species interacting with their fishing operations

Rationale

Reducing the impacts of commercial fishing on protected species relies on individual fishermen actively applying best practice mitigation methods to their fishing activity. Applying and developing mitigation methods in specific circumstances requires an understanding of the protected species that may be impacted, and the nature with which they interact with fishing activity. A range of relevant information exists, often the result of research projects, however, appropriate communication of this generally involves interpretation of research outputs to cater to specific audiences. Project MIT2014-01 used a hard copy and web based newsletter to provide a medium for this communication (Pierre 2016). Project MIT 2016-01 will build on this by not only producing a quarterly newsletter, to be distributed in both hard copy and electronic, but also a range of media articles which can be directly incorporated into other relevant publications such as industry magazines and port newsletters. This expansion of scope will allow increase in target audience exposure and uptake.

Previously the Department has produced identification guides for seabirds and sharks (e.g. CSP 2007, 2010). Having up-to-date identification tools will improve the ability of fishermen to accurately understand which species are interacting with their fishing operations, so that they can ensure adequate measures are being taken to avoid or minimise bycatch. The guides also provide distribution and behavioural information which help inform mitigation strategies. These tools will also help improve the quality of data reported on captured protected species, thus contributing to a better understanding of the nature and extent of interactions. Such data contributes to risk assessments used in fisheries management, and enables the development of appropriate mitigation options where required. This project will allow the production (e.g. printing costs) of education resources across a variety of media using data from existing sources such as observer records, tracking studies and the protected species identification projects (e.g. INT2016-02 and INT2015-02). Resources will be targeted at commercial fishers, preferably in a region and fishery specific manner to provide information on species of concern which will assist in development and refinement of effective mitigation strategies.

Project status

Complete.

Summary of the methods and key findings

To address the first objective of this project, eight newsletters were prepared and circulated during the project's two-year project term. Articles covered new, emerging, and best practice bycatch mitigation measures, research underway on mitigation, policy developments, current events, and other protected species information relevant to commercial fishing. Newsletters included key references accessible online to facilitate reader follow-up on items of particular interest.

The newsletter circulation included commercial fishers and others involved in the fishing industry, such as those holding fishing quota and annual catch entitlement, Seafood New Zealand's Sector Representative Entities and Commercial Stakeholder Organisations, seafood company representatives, Ministry for Primary Industries regional office staff, the New Zealand Federation of Commercial Fishermen, and practitioners working on fisheries bycatch issues. Throughout the project, the newsletter was distributed in html form via email, using Twitter and Facebook links, as an A4 2-page pdf file distributed electronically, and as a hard copy newsletter mailed to recipients who did not have an electronic point of contact or had specifically requested a paper copy.

Overall, each issue of the newsletter reached approximately 1,600 recipients directly. The html newsletter was opened by an average of 39 % of recipients through the project term (range: 34.3 – 42.9 % per issue). Most readers were located in New Zealand (83.2 % on average, per issue) and most international readers were based in the USA (14 %), and Australia or the UK (2 % each). Outside these countries, smaller numbers of readers were located in Argentina, Canada, China, France, Greece, Indonesia, Japan and Thailand (< 1 % of the total readership in each country on average, per issue). Twitter was the fastest growing channel for distribution, with an average of 430 views per issue (range: 239 – 762 views per issue).

Addressing the project's second objective was attempted by providing an article with images for publication in Seafood magazine. Publication of this was overshadowed by the parliamentary election of 2017 and the content was not picked up again subsequently.

To address the third objective of the project, two seabird identification guides previously produced by the Department of Conservation (the Fisher's Guide to New Zealand Seabirds and the Fisher's Guide to New Zealand Coastal Seabirds) were updated. These were reprinted in hard copy and made available as web-quality pdfs on the Department of Conservation's website. A new guide to protected fish and reptiles was also produced and made available, in the same A5 and highly pictorial style as the seabird guides.

It is recommended that the newsletter continues to be produced given the sustained levels of readership documented during this project. This regular circulation can usefully be complemented by the development of additional resources that use other formats and media.

Recommendations

- Continue the production and circulation of the Bycatch Bylines newsletter at a quarterly frequency,
- Produce a pictorial guide for fishers on handling protected species after capture in fishing operations,
- Continue the production of fact sheets on key bycatch mitigation measures (e.g. line-weighting), and,
- Develop a series of short (e.g. three to five minute) videos presented as "how-to" guides for fishers, on the basic use of key bycatch mitigation measures such as tori lines, line-weighting and fish waste retention. Videos would highlight fishers demonstrating how these measures can be applied safely and effectively on vessels.

Review milestones:

- Draft final report presented at the CSP TWG meeting on 28 February 2018.

- Final report made available at the CSP webpage in August 2018.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000 per annum. Services were provided by JPEC Ltd.

Citation

Pierre, J.P. 2018. Conservation Services Programme Project MIT2016-01: Protected Species bycatch media. Final Report. Prepared by JPEC Ltd for the New Zealand Department of Conservation. 9 p.

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https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/mit2016-01-protected-species-bycatch-media-annual-report-2016-17.pdf

4.5 MIT2016-02 Entanglement of cetaceans in pot/trap lines and setnets and a review of potential mitigation methods

Project Objectives

1. To characterise the nature and extent of entanglement of whale species in pot/trap lines and setnets in New Zealand and make recommendations on whether or not the current levels of risk warrant development or implementation of improved mitigation.
2. To identify and assess the current mitigation techniques for cetacean capture in the pot/trap lines and setnets both domestically and internationally and make recommendations as to their applicability in the New Zealand market.

Rationale

Cetaceans (primarily humpbacks, though also southern right whales and orca) can become entangled fish pot/trap lines or setnets (including down-lines). Within New Zealand this has most commonly been documented in Kaikoura, during winter, where the humpback whale northern migration comes close to shore and overlaps with the rock lobster fishing activity. In recent years there have also been increasing reports on the North Island, including Orca. The occasional Southern right whale has also been reported as entangled. DOC has a response team which will attempt a release a cetacean if conditions allow.

The number of reported incidents annually is low in New Zealand in comparison with some other countries; however, in recent years there has been a notable increase in occurrence outside of Kaikoura, and including other species. The frequency of humpback whale entanglements will also be related to the status of the humpback whale population as the risk of entanglement will increase with increasing numbers of cetaceans passing through the inshore waters of the East Coast of the South Island. DOC coordinates an annual survey of the humpback whale migration each winter, and the most recent season (2015) observed the highest count of whales coming through the Cook Strait (137) since the survey commenced in 2004.

It is timely to assess the level of risk posed to cetaceans from commercial pot/trap and setnet fishing activity, and determine whether or not the current level of risk warrants development or implementation of improved mitigation measures.

Project status

Ongoing.

Review milestones:

- Final annual report made available on the CSP webpage in September 2017.

Citation

Laverick, S., Douglas, L., Childerhouse, S. and Burns, D. 2017. Entanglement of cetaceans in pot/trap lines and set nets and a review of potential mitigation methods. Prepared for Department of Conservation, Wellington. 75p.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/mit2016-02-cetacean-entanglement-final-report.pdf

4.6 MIT2017-01 Protected Species Liaison Project

Overall Objectives

1. To provide liaison officers to the relevant inshore and surface longline fishing fleets, to assist those fleets reduce their protected species bycatch.
2. To coordinate the liaison officer roles with wider efforts targeted at protected species bycatch reduction in relevant fisheries to achieve the greatest reduction in bycatch possible.

Specific Objectives

Objective	Fishery	Area
1	Surface Longline	A – Northern North Island
		B – West Coast South Island
2	Bottom longline	A – Northern North Island
3	Inshore Trawl	A – East Coast South Island
		B – Northern North Island
		C – West Coast South Island
4	Setnet	A – East Coast South Island
		B – South Coast South Island

Rationale

To effectively reduce the risk of interactions with protected species it is important for vessels to take the latest developments in mitigation technology and be able to adapt them to their specific operations. Translating the latest scientific research and fishing regulations into operational parameters is not always a straight forward process. To achieve meaningful reduction of risk to a species it is necessary for there to be consistency of application of mitigation across all fleets interacting with the species. Protected species liaison officers have formed a vital interface between skippers, Government, and researchers. Other projects and processes are also underway, which aim to reduce protected species bycatch, including the work of collaborative groups involving industry and eNGOs, and processes driven by the Ministry for Primary Industries. Coordinating liaison officers with these other processes to maximise synergies and reduction results is important.

Over the past four years, liaison officers have been iteratively rolled out across a series of inshore and HMS fisheries, prioritised based on risk. In the past, this roll out has focused on seabird interaction, however with increased embedding of this programme it is now appropriate to expand to other protected species interactions, namely marine mammal, turtle, and protected fish and benthos interactions. The scope of this project also expands to include a wider range of inshore fishing methods.

The process to date has involved development and documentation of vessel specific mitigation practices in Seabird Management Plans, implementation of these plans into vessel practice, review by Government fisheries observers, and subsequent review and improvement where relevant. Currently there are a series of parallel and complimentary processes in place tasked with embedding operational procedures into inshore fishing activities. A coordination role as part of this project will be critical to aligning these approaches to ensure that maximum value will be gained.

The liaison role will include issuing mitigation gear to vessel operators as well as an education role. Conservation Management Measure CMM2008-03 requires Western Central Pacific Fisheries Commission (WCPFC) Members to adopt the United Nations Food and Agriculture Organisation (FAO) Guidelines to Reduce Sea Turtle Mortality where appropriate.

Project status

Ongoing.

Summary of the methods and key findings

To facilitate the ongoing efforts of fishers in reducing protected species bycatch, Liaison Officers were deployed in three fisheries in 2017/18: surface longline, Fisheries Management Area 1 (FMA 1) bottom longline, and Otago coastal trawl. Liaison Officers conducted a series of port calls visiting vessels in their fisheries, sharing information with vessel operators, skippers and crew, and providing advice from shore when bycatch events occurred at sea. A Coordinator supported Liaison Officer activities, communicated with Programme participants and stakeholders and provided whole-of-programme reporting through the year.

The 2017/18 Liaison Programme commenced with a workshop to develop systems, processes, and documentation. Liaison Officers then used a variety of sources to develop up-to-date lists of the vessels active in their fleets, and started working with those vessels to produce Protected Species Risk Management Plans (PSRMPs) and document practices in place to reduce protected species bycatch risks. Liaison Officers lodged the information they collected in an online information management system. PSRMP implementation on vessels was then audited by Government fisheries observers.

During their visits to vessels in port, Liaison Officers also distributed materials to assist the implementation of mitigation measures (e.g. tori line streamer materials). Further, throughout the term of their contracts, Liaison Officers responded to bycatch trigger events as reported from vessels. Triggers were developed as a risk management tool, to prompt vessel operators to evaluate their mitigation strategies, and seek Liaison Officers' input to work on reducing future capture risks.

In 2017/18, 34, 37 and 12 PSRMPs were developed for surface longline, FMA 1 bottom longline, and Otago coastal trawl vessels respectively. Plans covered both regulatory measures and voluntary approaches to protected species bycatch reduction. In all fisheries, a range of measures are documented, with the content of Plans being most diverse amongst vessels in the FMA 1 bottom longline fishery.

Observer audit information was received from 13 surface longline and 12 bottom longline trips. For surface liners, differences between practices documented in PSRMPs and those reported from audits mostly related to the management of fish waste discharge. The diversity and relative flexibility in practice that characterised bottom longline PSRMPs, and the fields in the audit form, made audits challenging in some areas. However, similar to the surface longline fishery, there were some differences in the management of fish waste discharge between PSRMPs and audit reports. There were no observer audits conducted in the Otago coastal trawl fishery.

In 2017/18, 25 and 11 trigger events were reported from surface and FMA 1 bottom longline fisheries, respectively. There were no triggers reported from Otago coastal trawl fisheries. Liaison Officers responded to triggers by working with operators to identify and address bycatch risks to reduce the likelihood of future captures when possible.

Recommendations

- Maintain the Programme's focus on continuous improvement in reducing the bycatch risks associated with interactions between protected species and commercial fisheries.
- Underpin and encourage ongoing improvement with robust policy, management and monitoring frameworks.
- Continue building a set of Programme documents that is consistent across fisheries in the Programme. Continue to develop awareness and outreach resources for use across the programme.
- Continue to monitor the implementation of PSRMPs at sea, noting that this can be accomplished by human observers and (to some degree) using electronic monitoring.
- Operate a feedback loop from Liaison Officers back to vessel operators, when at-sea audits of PSRMP are undertaken.

Review milestones:

- Draft final annual report presented at the CSP TWG meeting on 9 October 2018.
- Final annual report made available at the CSP webpage in November 2018.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $140,000 per annum. Services were provided by JPEC Ltd.

Citation

Pierre, J.P. 2018. Protected Species Liaison Coordination. Final Annual Report: Conservation Services Programme Project MIT2017-01. Prepared for Department of Conservation, Wellington. 36 p.

Weblink

https://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2017-18/protected-species-liaison-project/

4.7 MIT2017-02 Characterisation and development of offal management for small vessels

Specific Objectives

1. To characterise offal management strategies for trawl and longline vessels <28m both domestically and internationally.
2. To analyse these practices against protected species abundance and bycatch.
3. To provide recommendations on best practice offal management.

Rationale

Discharge of offal is one of the main factors leading to aggregations of seabirds around fishing vessels, leading to increased risk of interaction. In larger vessel fisheries (>28m), offal management has received extensive research; accordingly, regulation and operational practices constrain the activity to reduce risk of protected species interaction. Smaller vessel fisheries have received far less research into this subject and practices across the fleet are more variable, safety and stability concerns have been cited as limitations.

Despite the lack of regulation and potential operational constraints, offal management strategies are practice by sectors of the smaller vessel fleet. To ensure the greatest reduction in risk to seabirds it is important that all vessels attain operate offal management strategies effectively.

Project status

Complete.

Summary of the methods and key findings

To characterise discharging practises and their influence on seabird captures, we focused on observations and data recorded by government fisheries observers. Information reviewed was collected by observers on 108 trawl, 45 bottom longline, and 40 surface longline trips over the period October 2013–December 2016 in New Zealand. All vessels were <28m in overall length. We reviewed all trip reports and associated data extracts, and summarised discharge management practises (DMP). DMP categories were defined to cover the timing of discharge relative to fishing operations (discharging during set, haul, shoot, tow; discharging in batches, continuously, or holding), and the position of discharging relative to fishing gear (offside, stern).

Haul discharging was actively managed in 25–35% of longline operations, and discharge was always retained during setting. Trawlers rarely discharged material during hauling and actively managed discharge to reduce seabird risk in about 40% of trawl fishing reviewed. Most active management of discharging reported for bottom longline (BLL) operations involved offside discharging, or on the haulside in hauling breaks. On surface longline (SLL) trips, discharge management primarily involved discharging in batches or in haul breaks, on both sides offside and haulside. Most trawl operations limited discharging to the tow stage, but about 15% also discharged during shooting. Discharge batching was documented more often for SLL than for BLL (18% cf. 7% of trips, respectively), and was documented for 11% of trawl trips. Mitigation device use and the extent of other operational mitigation practises (e.g. night setting, line weighting, net cleaning) was roughly in line with previous studies.

Seabird captures recorded by observers (mostly albatrosses but also petrels and shearwaters) showed clear effects of discharge on capture rates. In general, any steps taken by fishers to manage discharge reduced seabird capture rates. Location was important for both bottom- and surface-lining, with lower seabird capture rates with offside discharging than haulside discharging, and holding untaken baits during hauling also reduced capture rates. In observed trawl fishing, seabird captures rates were lowest when a bird baffler was used, and appeared lower with net cleaning, illustrating the combination approach required for effective seabird mitigation.

Discharge management practises were not consistent within fleets or between trips of the same vessel, so bird capture risks will also vary. However, it is important to consider these findings in light of the limitations of the data (both the nature of the primary data and the scope of the dataset used). Since the data were not adequate for robust quantitative analyses, results of this work are necessarily qualitative, merely indicating promising areas to explore for developing discharge management in the smaller-vessel fleet.

Recommendations

Recommendations include a range of discharge management actions for liaison programmes to reinforce or advance with relevant fleets, and suggestions for next steps to progress discharge management work in smaller-vessel fisheries. Recommendations are also provided for enhancing data collection to improve understanding of the nature and extent of discharge management and protected species bycatch in New Zealand's smaller-vessel fisheries.

Review milestones:

- Draft final report presented at the CSP TWG meeting on 9 October 2018.
- Final report made available on the CSP webpage in December 2018.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000. Services were provided by Parker Conservation Ltd.

Citation

Rexer-Huber, K. and Parker, G.C. 2018. Characterisation of discharge management in small-vessel trawl and longline fisheries. Report to Conservation Services Programme. Parker Conservation, Dunedin. 44 p.

Weblink

https://www.doc.govt.nz/contentassets/535578e7dc5f4b989641f8f6e5168f7a/mit2017-02-final.pdf

4.8 MIT2017-03 Characterisation and mitigation of protected species interactions in the inshore trawl fishery

Specific Objectives

1. To characterise the nature and extent of protected species interactions in various sectors of the inshore trawl fishery
2. To provide recommendations on whether the level of current mitigation is adequate and whether alternative mitigation methods could be recommended.

Rationale

Information on the nature and extent of protected species interactions is important to ensure good fisheries management decision making and that best use is made of New Zealand's fisheries resources. There is uncertainty surrounding the level of total mortality in some inshore fisheries. The level 2 seabird risk assessment identifies inshore trawl as posing a risk to several albatross species. Although observer coverage has highlighted captures of a variety of protected species (seabirds, marine mammals, and sharks), and the level 2 seabird risk assessment identifies inshore trawl as posing a risk to several albatross species, there is uncertainty surrounding the overall level of total mortality in some inshore fisheries.

The inshore trawl sector is widely variable in terms of gear use and fishing practices as well as in the environmental conditions they encounter and protected species they overlap with. Understanding the fine scale drivers of capture events is key to implementation of effective mitigation.

Project status

Complete.

Summary of the methods and key findings

To review operational practises and protected species interactions in inshore trawl fisheries, as documented by government fisheries observers in New Zealand, we used information collected during 4,762 trawl events on 33 vessels across the inshore fleet from October 2013–December 2016.

Observers recorded a diverse range of protected species caught in nets, on warps (trawl cables) and as deck strike in inshore trawl operations. A total of 83 protected species interactions were recorded, including individuals of 12 species of seabird, two species of dolphin, New Zealand fur seals, a white-pointer shark and a green turtle. Some of these protected species have a high conservation threat classification and rank highly in fisheries risk assessments. While 88% of all protected species captures were of a single individual per fishing event, up to five individuals were caught in a single fishing event. Net captures accounted for 67% of seabird captures, warps 10% and deck-strike 21%. Captures of marine mammals, sharks and the turtle were all in the net.

Statistical modelling found key factors explaining captures were target fish species, fishery year and fishery area. However, observer coverage was numerically skewed to fisheries in northern areas, limiting understanding of the effect of inshore trawling on protected species that are rare or absent in northern parts of the country. Species more abundant in southern NZ that are consistently caught in offshore trawl fisheries include white-chinned petrels, white-capped albatross, sooty shearwaters, Salvin's albatross, Southern Buller's albatross, grey petrel, Cape petrel and NZ fur seal. It is not

unreasonable to expect that inshore trawl fishing in the South Island may have more seabird and NZ fur seal interactions than recorded here.

Seabird capture rates showed clear effects when bycatch mitigation was used. In observed trawl fishing, seabird captures rates were lowest when a bird baffler was used, and appeared lower with net cleaning, illustrating the combination approach widely recommended for effective seabird mitigation. Discharging small fish or offal did not explain all captures, with some seabirds caught when no discharge was occurring. Mammal (one bottle-nosed and seven common dolphins and five NZ fur seals), shark and turtle captures appeared influenced by discard type, increasing with offal discards. Practises were not consistent within fleets or between trips of the same vessel, so capture risks will necessarily also vary.

It is important to consider these findings in light of the limitations of the data. Observer coverage of the inshore trawl fleet was low, so the number of trawl events and vessels included here was necessarily small. Observer placement was non-random, producing geographical and temporal skews in the data which affect result interpretation. Recognising these data limitations, we supplemented quantitative analyses (where appropriate to the data) with qualitative assessments. These exploratory analyses merely indicate promising patterns and areas to explore for understanding protected species capture in inshore trawl fisheries.

Recommendations

Recommendations cover mitigation equipment and operational practices that could help reduce protected species bycatch, as well as research areas to progress for mitigating protected species captures in the inshore trawl fleet. Recommendations are also provided for enhancing data collection to improve understanding of the nature and extent of protected species captures in inshore trawl operations.

Review milestones:

- Draft final report presented at the CSP TWG meeting on 9 October 2018.
- Final report made available at the CSP webpage in December 2018.

Project logistics summary statement

This project was 100% funded via Conservation Service Levies on the fishing industry. The planned cost for the project was $30,000. Services were provided by Parker Conservation Ltd.

Citation

Parker, G.C. and Rexer-Huber, K. 2018. Characterisation and mitigation of protected species interactions in inshore trawl fisheries. Final report to Conservation Services Programme, Department of Conservation. Parker Conservation, Dunedin.

Weblink

https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/marine-conservation-services/reports/mit2017-03-protected-species-interactions-trawl-fishery-final.pdf